

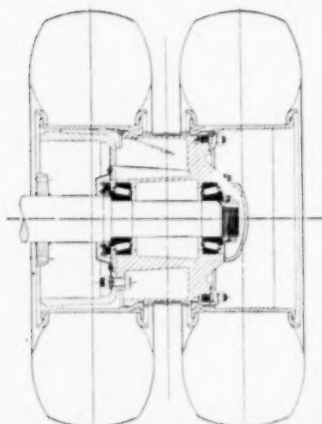
# ROADS AND STREETS

HIGHWAYS BRIDGES  
AIRFIELDS  
HEAVY CONSTRUCTION

MAY 1954

Gillette Publishing Co., 22 W. Maple St., Chicago, Ill.  
Form 3547 Requested

Acceptance Authorized Under Sec. 34.64 P. L. & R.



**HOW EASTON CAR & CONSTRUCTION COMPANY** mounts the wheels of its giant TD trailers on Timken bearings to withstand jolting shock loads.



## Crashing limestone, jolting road shocks—so they mounted the wheels on **TIMKEN** bearings

45 tons of limestone come crashing into this big Easton tandem trailer, which then rides at high speeds over quarry roads to a cement plant.

All the jolting impacts are taken by the Timken<sup>®</sup> tapered roller bearings which support the wheels on the axles. And, rugged enough to take the heaviest shock loads, these bearings are also fine precision mechanisms.

To get steel good enough for these bearings, we make our own—Timken fine alloy steel. To provide wear-resistant surfaces and shock-resistant cores, the bearings are case-carburized. They're tough on the inside, hard on the outside.

And Timken bearings have *inherently* high load capacity because the load is carried on a *full line contact* between rollers and races.

With these Easton trailers on the straight and level, the bearings withstand radial loads. But turning corners, the bearings also have to take sidewise *thrust* loads. The taper enables Timken bearings to take both radial AND thrust loads in any combination.

Timken bearings are a sure sign of quality on the equipment you buy—the equipment you build. Always look for the trade-mark "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

**TIMKEN**  
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER □ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST —●— LOADS OR ANY COMBINATION

**P&H**

# SINGLE PASS STABILIZERS



Processing a new soil-cement street, Jackson, Miss.

## ENGINEERS who know prefer the **P&H** method for these reasons:

### **More accurate control**

Success on any soil stabilization job depends primarily upon the accurate proportioning of materials. P&H gives you *complete control* of this factor, including the liquid applications, with accuracy comparable to laboratory standards. It means uniform high quality every step of the way, on every job.

### **Reduced material costs**

**BITUMEN:** Because mixing is done before the liquid cools, appreciable savings may be effected by the use of a heavy grade of cut-back asphalt.

**CEMENT:** Extra cement added to compensate for job variations can be eliminated, due to P&H's accurate proportioning, rapid mixing and quick compaction.

**WATER:** A single application, with mixing followed immediately by compaction, means far less evaporation loss.

### **No need for extra width**

The common practice of allowing 6" to 1' on each side for irregular or faulty construction is *out*. The P&H method gives you a clean, firm edge matching the depth and quality of the entire base. Saving amounts to about 5% of total yardage processed.

### **Fewer men needed**

With all work concentrated in a smaller area, it takes fewer men to keep all operations under control. Faster completions enable limited personnel to handle more work.

Whatever way you look at it, P&H Single Pass Soil Stabilizers give you better roads, quicker, at lower cost. If you plan stabilization work of soil-cement, soil-bituminous or clay-gravel, contact us now for latest information.

**P&H SINGLE PASS STABILIZER**  
**HARNISCHFEGER**  
**CORPORATION**  
MILWAUKEE 46, WISCONSIN







## Only 2 Field Joints Needed for this 42-ft Sheet Steel Culvert

Three 14-ft sections of 18-in. diameter, galvanized-sheet-steel culvert pipe can be assembled into a 42-ft culvert with only two simple field joints. And it can be done in a few minutes.

Compare this with the number of joints and man-hours required to assemble an equivalent culvert of any other material.

Further, these sections of 18-in. pipe are made of 16-gage sheet, and they weigh about 214 lbs each. This means that they can be unloaded and placed in a trench by two men without the aid of special lifting equipment.

### A MORE FLEXIBLE CULVERT PIPE

Pipe made from corrugated steel sheet is strong, flexible and tough, regardless of diameter. It will conform to grade and alignment without pulling apart. It can absorb changing loads caused by shifting or freezing soil.

Bethlehem does not fabricate culvert or drainage pipe, but does manufacture the Beth-Cu-Loy galvanized corrugated and flat steel stock used by pipe fabricators. This copper-bearing steel meets Federal specifications, as well as those of the American Association of State Highway Officials.

The heavy zinc coating and the copper in Beth-Cu-Loy sheets provide a double defense against rust. Their corrosion-resistance is excellent. Pipes made of this steel can be expected to give many years of trouble-free service.

Any Bethlehem sales office will gladly furnish detailed information.

### BETHLEHEM STEEL COMPANY BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



## BETH-CU-LOY GALVANIZED CULVERT SHEETS

When writing advertisers please mention **ROADS AND STREETS**, May, 1954

# ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 62 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892.

MAY, 1954

VOL. 97

No. 5

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# Put it on the tough jobs—

THE HARD ROCK LUG CAN TAKE IT!



**O**NLY a tire that's supremely tough—*through and through*—can keep your trucks moving on schedule—full payloaded—safely, surely, month after month. That's why today's Goodyear tires combine the toughest tread stocks known, with Goodyear's new Triple-Tempered 3-T Cord.

3-T Cord construction cuts your operating costs as no other type cord can. It's produced by a new secret Goodyear process that fully controls cord stretch—makes tires most bruise-resistant, heat-resistant. This assures vastly greater endurance, reduces cracking, tread and body failures to new **LOW** lows. Get *all* the facts before you buy or specify another tire!

Goodyear, Truck Tire Dept., Akron 16, Ohio

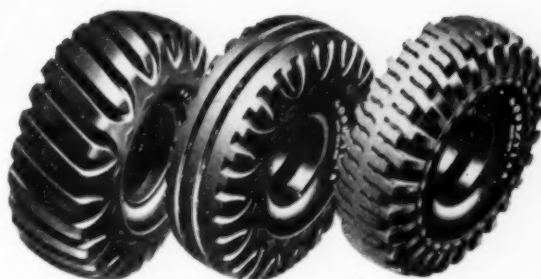
**FOR EACH JOB, THERE'S A  
COST-CUTTING GOODYEAR TIRE!**

# GOOD YEAR

**MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND**

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

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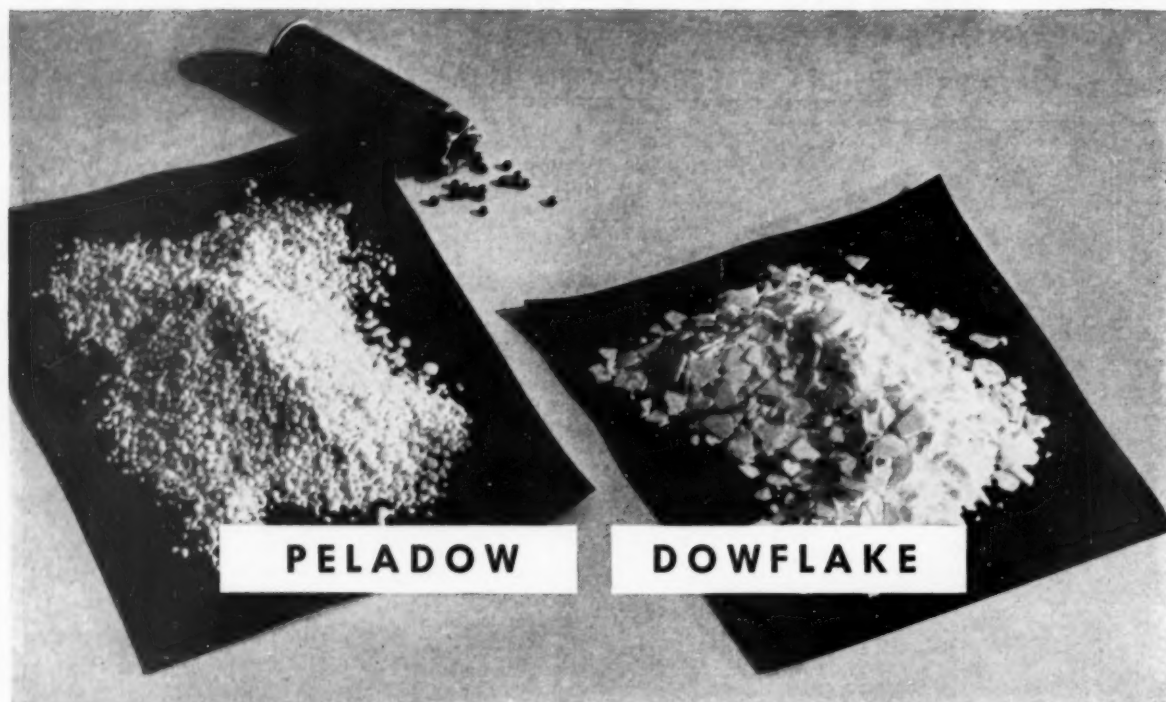
— Companion tire for front wheels on tough jobs.

#### **ROAD LUG**

— Sure traction off road, smooth rolling on-road.

**ALL NOW TOUGHER, LONGER-LIVED  
BECAUSE OF NEW 3-T CORD!**

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



Peladow and Dowflake are trade names for the two forms of Dow calcium chloride. Dowflake comes in free-flowing flakes in a 77-80% concentration. Peladow, in buckshot size pellets, is especially designed for bulk shipment.

Because of its high-test concentration (94-97%), smaller quantities per application are required; freight and handling costs are cut. In addition to 100 lb. bags, Peladow can be shipped bulk in closed hopper cars.

## TAKE YOUR CHOICE OF TWO CONVENIENT FORMS OF DOW CALCIUM CHLORIDE

Now Dow calcium chloride is available in two convenient forms—new Peladow® and Dowflake®—both engineered to help build and maintain better, safer, more stable roads for your area. In concrete road construction, Peladow or Dowflake added to the mix helps concrete set faster and increases its workability, density and strength. Peladow and Dowflake also offer the two most convenient and economical means of using cal-

cium chloride to control ice and dust on highways and secondary roads. By stabilizing the gravel roads in your area with these products, gravel loss can be reduced up to 85%.

Contact Dow now for more information. Get the complete story on how conveniently, effectively and economically Dow's Peladow and Dowflake can help maintain dustless, stable, *safer* roads.

Write THE DOW CHEMICAL COMPANY, IN-982C-2, Midland, Michigan.

*you can depend on DOW CHEMICALS*

**DOW**



*200  
cubic yards  
an hour on a  
1500-foot  
haul*



Cat® DW20 Tractors and W20 Wagons are key units in the earthmoving spread of Geo. Bennett Construction Co., Kansas City, Kansas.

Loaded by the dragline, one of these machines handles 18 cubic yards of material and makes 11 to 12 quarter-mile round trips to the fill per hour. On a construction job near Turner, Kansas, three DW20-W20 units moved 25,584 yards of earth in five working days.

The Bennett Co. also has Caterpillar DW21s, D8s, D7s and Scrapers in its big yellow fleet. Mr. Bennett says: "I have been using Cat machines since 1920. They've been tough and rugged and have held up better than any competitive product I know of."

The fast-moving DW20 Tractor, with its 225-HP Caterpillar Engine, furnishes perfectly matched power for the W20 Wagon. The wagon itself is built to outperform and outlast any other hauling unit in its class. It's engi-

neered for the job, with weight evenly distributed between tractor and wagon tires. Hydraulic ram dumping gives the operator accurate control. And the generous size of the hopper offers a good target for the shovel.

Get actual production figures from your Caterpillar Dealer, nearby for information and service. He'll demonstrate right on your job, where you can compare cycle times with other equipment. Call him today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

**CATERPILLAR**





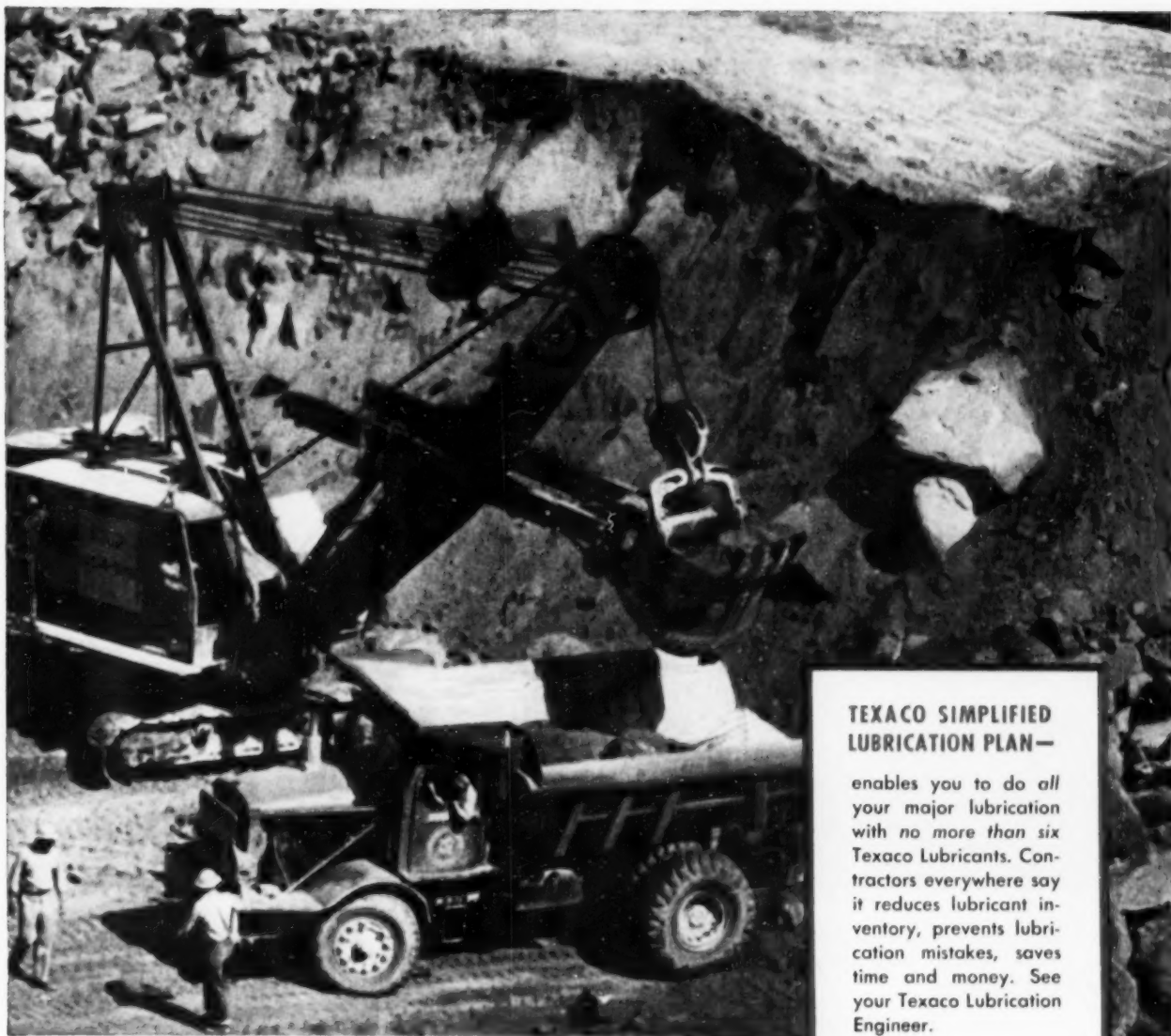
**MORE  
POWER...  
LESS FUEL  
...FEWER  
OVERHAULS**

**WHEN YOUR ENGINES** are lubricated with one of the famous *Texaco Ursa Oil* series, you'll find you get a lot better performance at a lower cost. The *Texaco Ursa Oil* series is a *complete line* of lubricating oils especially refined to make heavy duty gasoline and diesel engines give *more power with less fuel over longer periods* between overhauls.

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enables you to do all your major lubrication with no more than six Texaco Lubricants. Contractors everywhere say it reduces lubricant inventory, prevents lubrication mistakes, saves time and money. See your Texaco Lubrication Engineer.

fuel used, the right member of the *Texaco Ursa Oil* series will keep it clean, prevent bearing corrosion and keep rings free for proper compression and combustion.

In hydraulic mechanisms, use *Texaco Regal Oil R & O*. It has *more than ten times the oxidation-resistance* of ordinary turbine-quality oils in this service, keeps systems free from rust, sludge and foam. To keep wire rope strong longer, use *Texaco*

*Crater*. Also ideal for open gears.

Let a Texaco Lubrication Engineer help you simplify your lubrication, step up the efficiency of your equipment and bring down your costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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FOR ALL CONTRACTORS' EQUIPMENT



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are powered and priced  
to save you plenty!



When it comes to saving money, you just can't beat a new Chevrolet truck. Here are two good reasons why this is true—

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In fact, your savings start the moment you close the deal for your new Chevrolet truck. That's because Chevrolet is America's lowest-priced line of trucks. And yet, no other truck at *any* price offers you all the new features and advantages you get in these great new Chevrolet trucks.

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You save on operating costs with thrifty new high-compression power . . . on upkeep costs with new chassis ruggedness. And you get these savings

with every new Chevrolet truck—from light delivery models to heavy-duty haulers. In addition, Chevrolet trucks traditionally put you dollars ahead at trade-in time.

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ON ANY JOB!**

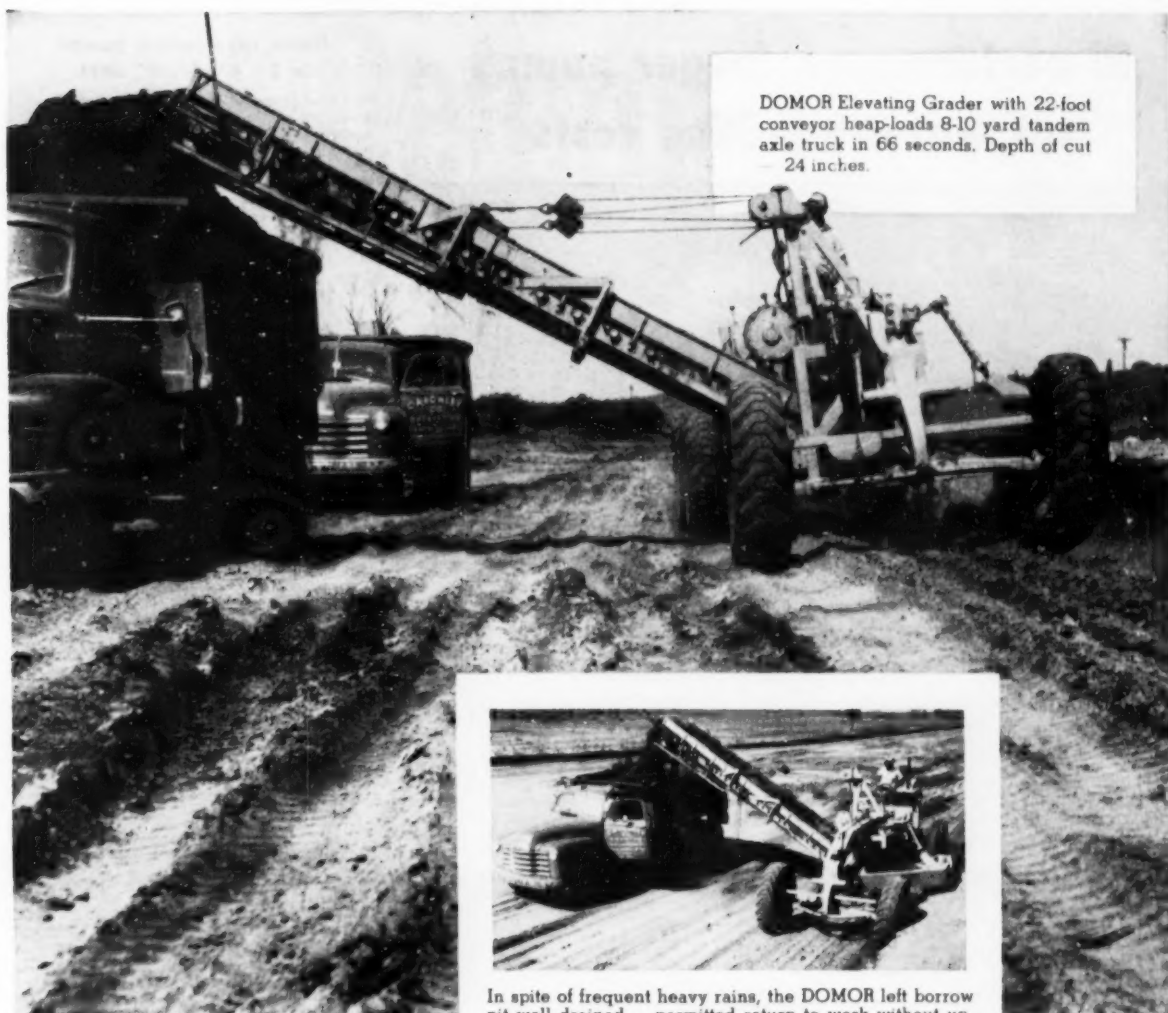
### CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

**DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT**\*—eliminates back-rubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

\*Optional at extra cost. Ride Control Seat is available in standard cabs only. "Jobmaster 261" engine on 2-ton models, truck Hydra-Matic transmission on 1/2-, 3/4- and 1-ton models.

**THREE GREAT ENGINES**—The new "Jobmaster 261" engine\* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION**\*—offered on 1/2-, 3/4- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models.





DOMOR Elevating Grader with 22-foot conveyor heap-loads 8-10 yard tandem axle truck in 66 seconds. Depth of cut — 24 inches.

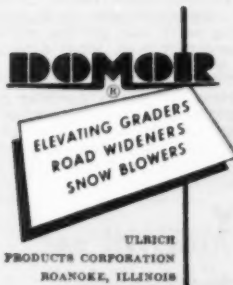
In spite of frequent heavy rains, the DOMOR left borrow pit well drained — permitted return to work without unreasonable delays.

## LEVEE BORROW

**...yields an average of  
2200 yds. per day to  
DOMOR Elevating Grader**

C. A. Powley, Peoria, Illinois contractor, using the DOMOR Elevating Grader to move the lion's share of 180,000 yards of topsoil dressing for a 3½ mile levee along the Illinois River.

See Your Caterpillar-Domor Dealer



**Ulrich Products** CORPORATION  
ROANOKE, ILLINOIS

## Hi-performance Jaeger pumps cut water-handling costs



### New Model 2PN moves all the water a 2" hose can handle

This latest Jaeger 2" pump delivers its rated 10,000 gph when operating at only 2400 to 2550 rpm (as much as 400 rpm slower than similar pumps). It will actually pump all the water that can be pulled through a 2" suction line under average pumping conditions. You'll find it conservatively rated, even at heads

well above 100 ft. Weighs only 190 lbs. including big pneumatic tires, measures only 24" x 21" x 26" high, yet it's built for heavy duty service with 20% steel shell, reversible liner plate, long-life Jaeger Lubri-Seal on shaft, impeller adjustable for wear and powerful Wisconsin AKN engine of 5.3 hp at 2500 rpm.



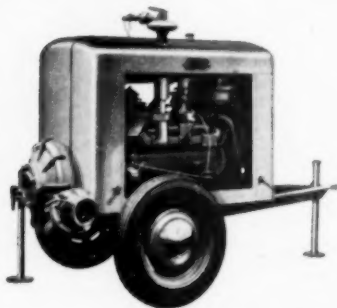
### Pumping 4,000 gpm with low-cost diesel power

Because they develop their full rated volume at low operating speeds, big Jaeger pumps are ideally suited for diesel operation on big cofferdam and well point work. The Jaeger Model 10PD above is pumping 4000 gpm at 1500 rpm. This high efficiency at fuel-saving, engine-saving speeds is an ex-

clusive characteristic of Jaeger "Sure-Prime" pumps. It requires larger shells and impellers but pays off in performance. Jaegers prime without engineering, don't vapor-lock on hard pulls, consume less fuel and average thousands of hours longer service than pumps that must run at higher speeds.

### Latest type jetting pumps in 3", 4", 5", 6" sizes

For a wide range of volumes, and pressures up to 275 psi, Jaeger has developed the most modern type of high pressure pumps... self-priming at the rate of 1 second per foot of lift, equipped with enclosed impellers, labyrinth sealing rings, positively lubricated shaft seals, automatic spring-actuated check valves, heat-resisting stellite-valved engines:



Model 3CPH delivers 420 gpm at 40 lbs., 125 gpm at 130 lbs., with air-cooled Wisconsin VF-4 (25 hp @ 2400 rpm).

Model 4CPH delivers 700 gpm at 75 lbs., 325 gpm at 200 lbs., with 6 cylinder engine of 218 cu. in. displacement (80 hp @ 2500 rpm).

Model 5CPH delivers 825 gpm at 80 lbs., 200 gpm at 250 lbs., with 6 cylinder engine of 236 cu. in. displacement. (95 hp @ 2600 rpm).



### 1 1/2" to 10" Electric Pumps

Jaeger "Sure Prime" pumps with electric motor drive are available for all types of dewatering, including the operation of Jaeger Well Point Systems. The characteristic low speed (1150 rpm) operation of Jaeger 6" to 10" electric pumps results in much longer life. Jaeger's oversize shells, holding more priming water, also prevent overheating and vapor-lock even when exhausting the longest well point header lines.

For engineering service on pumping problems, or specific information about any Jaeger pumps, see your Jaeger distributor or write. For file data, request Catalog P-4.

## THE JAEGER MACHINE COMPANY

223 Dublin Avenue, Columbus 16, Ohio

TRACTOR LOADERS • COMPRESSORS • CONCRETE MIXERS • PAVING MACHINES

# Put these **Detour-Busters** on the job



**WORKING AGAINST** a 20-day deadline, contractors graded and graveled a section of state highway to eliminate a long traffic detour. Here we see one of the fast moving INTERNATIONAL TD-24 and scraper teams that did the job in a hurry.

**Let INTERNATIONAL Scrapers break up the slowdowns and delays that cost you money. See how they can put you back on the main road to moving dirt on time, at lower cost.**

Keep the dirt flying. That's what they are made for! Everything about these big, easy-running scrapers points in one direction:

**More dirt, less time on every cycle.**

And how they do it! No detours here: Fast loading of bigger payloads, with less power. Improved flotation. Easy, clean dumps. Short turning radius. Remarkable stability on slopes. Rugged, simple construction that cuts maintenance to the bone!

Choose from four sizes (10 to 27.5 yard heaped capacity) to fit your job and your power. All four have the features and strength and simplicity that speed up the cycle—keep you on schedule, or well ahead of it!

Do you have dirt to move, and cost problems staring you in the face? Then there is a man you ought to know—your IH Distributor. He handles INTERNATIONAL Scrapers and can give you all the facts and figures about them. See him for "Power that Pays."

**For every move in Earthmoving**

**ON TRACKS ...ON RUBBER**

**See INTERNATIONAL'S  
"Job-Phased" equipment**



## INTERNATIONAL

\*Phased Equipment—Machines designed and built to handle each major phase of earthmoving most efficiently and economically.

# HEARD THE LATEST? THE **BLAW-KNOX** *"Complete Package"*

**NOW CONTAINS  
EVERYTHING YOU NEED FOR...**



## PAVING HIGHWAYS AND AIRPORTS

is a highly profitable operation with the Blaw-Knox "Complete Paving Package." It consists of Clamshell Buckets, Aggregate and Cement Batching Plants, Self-Aligning Road Forms, Precision Subgraders, Multifoot Pavers, Concrete Spreader and Finishing Machines.

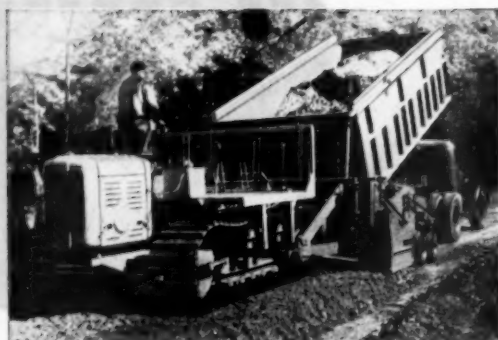


## READY-MIX OPERATIONS

show greater profit with the Blaw-Knox one-source "Complete Ready-Mix Package." It includes Aggregate and Cement Batching Plants, famous Hi-Boy Truvmixers, Clamshell and Concrete Buckets, Truck Mixer Loading Plants, Central Mixing Plants and Steel Forms.

# BLAW-KNOX

*... your only source for the "Complete Package"*



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is fast and economical with this big capacity Blaw-Knox Base Paver which lays stone, slag, gravel, soil cement or crusher run aggregates up to 400 tons per hour in depths up to 20" and widths up to 16'. V-type hopper and oscillating screed prevent segregation. There's ample traction for the softest going and plenty of power to push your truck. Operating costs are low. Two sizes available to fit every job.



## PROFITABLE WIDENING JOBS

are assured with these time and labor saving Blaw-Knox Road Wideners. They handle concrete, asphaltic concrete and any kind of aggregate without forms to cut costs. Speedy, efficient operation spreads and finishes concrete up to 1 1/2 miles per day... builds earth shoulders at a 200 ton per hour clip. Two models are available to handle widths from 2 to 10 feet.

**BLAW-KNOX COMPANY**  
BLAW-KNOX EQUIPMENT DIVISION  
Pittsburgh 38, Pa.  
Offices in Principal Cities



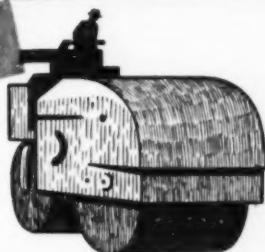


NATION NEEDS MORE ROADS!

TRAFFIC LOADS, SPEEDS BEING STEPPED UP!

GRAVEL SUPPLY SHORT IN MANY AREAS!

COSTS GOING UP!



Yes, the **PRESSURE** is on...**YOU!**

**PLAN NOW . . . Better Stabilization . . . of Bases, Surface  
Shoulders . . . for a Total Cost of 5¢\* per Square Yard with**

## STERLING ROCK SALT

*"NATURE'S OWN SOIL STABILIZER"*

STERLING ROCK SALT keeps your road mix "alive" . . . able to adapt itself and compensate quickly for excessive moisture or dryness, and sudden temperature changes. Water swells clay. But, in heavy rains, salt changes to brine, preserving the bond. In dry spells, salt crystallizes at the surface, preventing the clay binder from drying up.

Rock salt is soil's "thermostat" — the *natural* ingredient that keeps aggregates, fines and clay together in year-round permanence. Order your spring needs NOW or, for more information, send coupon.

\*Actual cost-check from Hancock County, Ill.—\$.0464

**INTERNATIONAL SALT COMPANY, INC.  
INDUSTRIAL DIVISION, SCRANTON, PENNSYLVANIA**

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"Better Highways  
Through Salt-Soil  
Stabilization"



Application methods and  
operational procedures . . .  
plant and road mixing . . .  
storage and handling hints  
. . . a wealth of helpful, prac-  
tical on-the-job information.

### IMPORTANT COUPON—MAIL TODAY

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☐ Please have representative call. ☐ Send complete file of "Better Highways" bulletins.

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Company

Address

City  Zone  State

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# 317

CU. IN.

V-8 CYLINDER  
HEAVY DUTY

# ENGINE

- ★ ULTRA-MODERN DESIGN
- ★ GAS-SAVING LOW FRICTION
- ★ OVERHEAD VALVE
- ★ HIGH COMPRESSION
- ★ LARGE BORE
- ★ SHORT STROKE
- ★ DEEP RIGID BLOCK



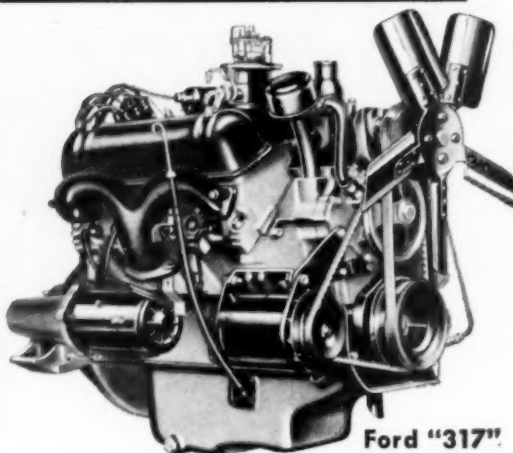
COMPLETE  
POWER UNIT

Designed especially for  
dependable, economical  
**INDUSTRIAL SERVICE**

*This folder is available fully describing the new Ford "317" Industrial Engine, including detailed specifications, horsepower and torque curves, dimensional drawings, etc. Send for your copy now.*



The Most Efficient  
Industrial Engine in its Class!



Ford "317"  
ENGINE ASSEMBLY

The new Ford "317" V-8 Industrial Engine offers *superior efficiency*, with completely modern features that equipment manufacturers, their designers and engineers will recognize as far ahead in the field of internal combustion gasoline engines:

- ★ Short stroke, low-friction design to reduce internal friction and heat losses for more usable power from less gas and with less engine wear!
- ★ Large bore permits greater diameter overhead intake and exhaust valves of free-turning design with integral guides, for higher breathing efficiency and longer valve life.
- ★ Compact, wedge-shaped combustion chambers for high turbulence, lower energy loss, more power from displacement size.
- ★ Built-in full-flow oil filtration for 100% protection of all bearings and prolonged engine life.
- ★ Outstanding structural rigidity with deep-skirt crankcase for 240° bearing support, wide-base flywheel housing connection and short, large diameter, fully-counterbalanced crankshaft for superior resistance to vibration.

These and many other progressive design details result in an industrial engine that's tops in gas-saving power—developing high torque per cu. in.—compared with other make engines of this size.

Ford Sales Engineers are always glad to discuss your particular power problems and extend every possible help in solving them. You have merely to phone or write to—

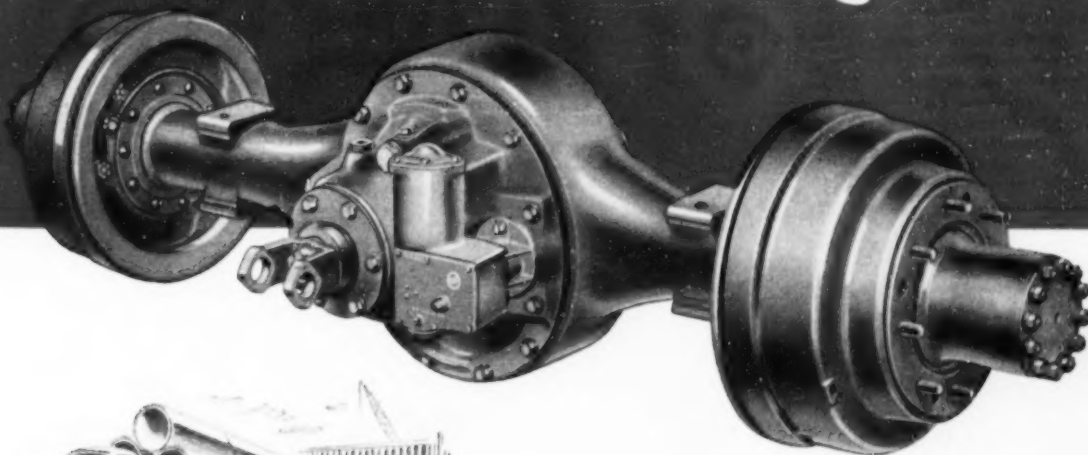
INDUSTRIAL ENGINE DEPARTMENT  
**FORD MOTOR COMPANY**  
15030 Woodward Avenue, Highland Park 3, Michigan



YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED!

**INDUSTRIAL ENGINES  
AND POWER UNITS**

**Eaton 2-Speed Axles save engines, keep trucks on the job, reduce operating and maintenance costs, make trucks last longer**



More than two million  
Eaton Axles in trucks today!  
For complete information, see your truck dealer.

Eaton 2-Speed Axles double the conventional number of gear ratios, enabling drivers to select a ratio to deliver pulling power or speed—the ratio best suited to road and load conditions. Engines operate in their most efficient and economical speed range, reducing stress and wear on engine and power transmitting parts, holding operating and maintenance costs to a minimum, adding thousands of miles to engine and over-all vehicle life. Eaton 2-Speed Axle trucks haul more, faster, longer, at lower cost—are worth more when traded in.

# EATON

## *2-Speed Truck*

# AXLES

*Axle Division*

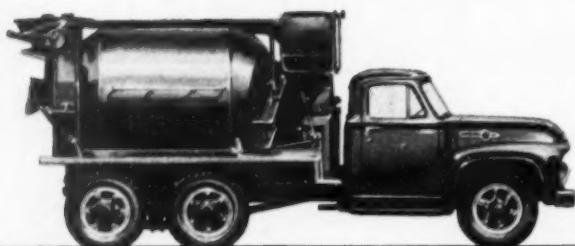
EATON MANUFACTURING COMPANY  
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**PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

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## ANOTHER WAY YOU SAVE WITH FORD TRIPLE ECONOMY

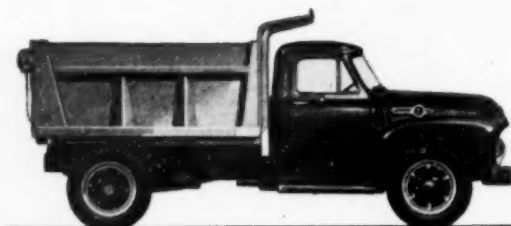


**2 New Tandem Axle Big Joss . . .  
up to 3800 lbs. more payload  
than other make 6-wheelers**

Brand new Ford factory-built T-700 and T-800 six-wheelers rated for 27,000 lbs. and 40,000 lbs. GVW, up to 60,000 lbs. GCW. Powered by Low-FRICTION V-8's—138-h.p. *Power King* and 152-h.p. *Cargo King* (T-700), 170-h.p. *Cargo King* (T-800).

**4 New Conventional Models  
. . . up to 27,000 lbs. GVW  
—55,000 lbs. GCW**

New Ford Series F-700, F-750, F-800, F-900 offer body and payload capacities up to 20,117 lbs. Three new Low-FRICTION V-8's give you gas-saving power, from 138- to 170-h.p., concentrated in 256 to 317 cubic inches displacement.



**4 New Cab Forwards . . .  
up to 2500 lbs. more payload**

Ford's giant new Cab Forwards, C-700, C-750, C-800, C-900, haul 35-ft. trailers within the legal limit in all states. Rated up to 27,000 lbs. GVW, up to 55,000 lbs. GCW. C-900 handles up to 2500 lbs. more payload than other make cab forwards with 55,000 lbs. GCW.



# '54 Fords go big on BIG JOBS!

**Ten series in Ford's expanded line of new extra heavy duty trucks.**

**New V-8 power up to 170-h.p.! New Master-Guide Power Steering! New money-saving capacities give you another way to save with Ford Triple Economy.**

Now there's a Ford Truck to handle your toughest, heaviest hauling and do it with economy that's new to the extra-heavy-duty field.

New Low-FRICTION, Overhead-Valve V-8's deliver as much as 44% more power per cubic inch than other truck engines in their class. The fewer cubic inches an engine has, the less gas it usually needs. New Short-Stroke design cuts friction, increases engine life.

New *Master-Guide* Power Steering is standard on T-Series with *Cargo King* engines, optional at worthwhile extra cost on F-Series with *Cargo King* engines. It cuts steering effort up to 75%! Ford's new 3-man *Driverized* Cabs and controls provide comfort and driving ease to help the driver do a better job, faster and with less effort.

For new slants on heavy duty truck economy, call your Ford Dealer *today*, or write: Ford Division, Ford Motor Co., Dept. T-14, Box 658, Dearborn, Mich.

### SAVE WITH ALL THREE!

1. New Gas-Saving Power
2. New Driver-Saving Ease
3. New Money-Saving Capacities

## FORD TRIPLE ECONOMY TRUCKS

**MORE TRUCK FOR YOUR MONEY!**



# "Eucs" on every major dam in the *Pacific Northwest!*



Yale Dam of Pacific Power & Light Co. in Washington built by Morrison-Knudsen Co., Inc.



*Euclid equipment  
is just as prominent  
on hundreds of other  
earth moving jobs  
all over the world!*

Men who plan and build the big projects know what an advantage it is to have earth moving equipment that's dependable and gets the job done faster and at lower cost. That's why you'll find "Eucs" on practically every earth moving job . . . airports, dams, roads, mine and quarry operations, and industrial work.

In the Pacific Northwest, for example, Euclids have been standard equipment on all of the large storage, irrigation, power, and flood control dams built during the past ten years. Large fleets of "Eucs" . . . over 500 Bottom-Dumps, Rear-Dumps and Scrapers . . . moved tremendous tonnages.

On many of these jobs a million or more yards of heavy excavation had to be moved over steep grades and long, tough hauls. Penalty clauses made it imperative that contract deadlines be met regardless of weather and other adverse conditions. The rugged dependability of Euclid equipment has been an important factor in keeping these projects on or ahead of schedule.

When you need large capacity, high speed earth moving equipment, check with any Euclid owner. You'll find that "Euc" performance has paid off by moving more loads per hour at more profit per load . . . and it can do the same for you.

**EUCLID DIVISION** GENERAL MOTORS CORPORATION, Cleveland 17, Ohio



## Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE





Rotary Snow Plow



Fork Lift



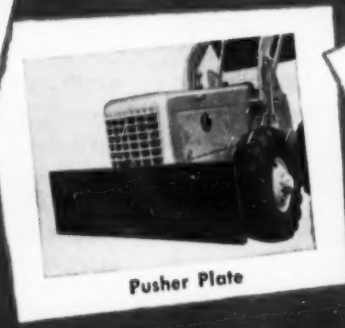
Bulldozer Blade



Crane Hook



V-type Snow Plow



Pusher Plate



Winch



Back Hoe



Operator Cab

# attachments

## — a big **PAYLOADER®** *plus*



Scarifier



Rigid and Reversible  
trip-blade Plows

"PAYLOADER" tractor-shovels equipped with standard buckets are extremely versatile. But the wide variety of available attachments greatly increases "PAYLOADER" usefulness and investment value — enables them to be profitably employed more days in the year.

So first choose the tractor-shovel that just *fits* your needs from the "PAYLOADER" line. It's the *one* complete line — seven *proven* models from 12 cu. ft. to 2 cu. yd. bucket capacity. Afterwards, you can acquire any of the special attachments, when and as you need them.

Your nearby "PAYLOADER" Distributor is ready to help you choose the model and attachments that best fit your needs. He also has the parts and service facilities to keep your "PAYLOADER" profitably productive. The Frank G. Hough Co., 768 Sunnyside Ave., Libertyville, Illinois.

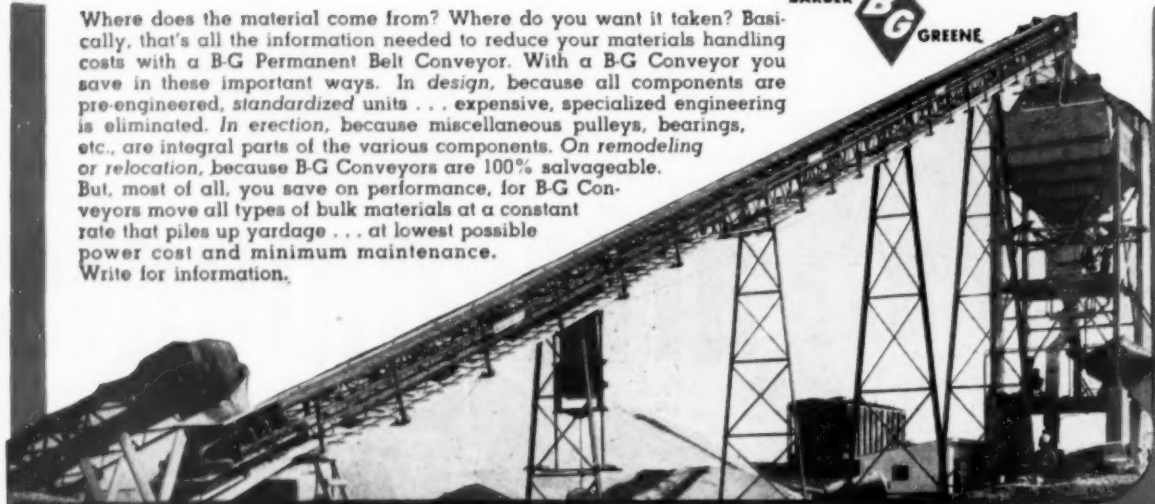
WRITE FOR FREE INFORMATION on any "PAYLOADER" you are interested in: four-wheel-drive, rear-wheel-drive, front-wheel-drive — 12 cu. ft. to 2 cu. yd. bucket capacity.



# HOW YOU SAVE MONEY

## .. WITH STANDARDIZED PERMANENT CONVEYORS

Where does the material come from? Where do you want it taken? Basically, that's all the information needed to reduce your materials handling costs with a B-G Permanent Belt Conveyor. With a B-G Conveyor you save in these important ways. In *design*, because all components are pre-engineered, *standardized* units . . . expensive, specialized engineering is eliminated. In *erection*, because miscellaneous pulleys, bearings, etc., are integral parts of the various components. On *remodeling* or *relocation*, because B-G Conveyors are 100% salvageable. But, most of all, you save on performance, for B-G Conveyors move all types of bulk materials at a constant rate that piles up yardage . . . at lowest possible power cost and minimum maintenance. Write for information.



## ... WITH HEAVY-DUTY PORTABLE CONVEYORS

When materials handling calls for a heavy-duty portable conveyor, B-G has the answer, too. Here is the heavy-duty, pneumatic-tired Model 374 available with belt widths of 18", 24" and 30", in lengths of 30' to 60'. The 374 will handle any bulk material—sand, stone, wet concrete, coal—at capacities from 150 to over 425 tons per hour . . . with a single operator. Every aggregate producer, contractor, city, county and state highway department will want full information on the B-G Model 374 Heavy-Duty Portable Belt Conveyor.



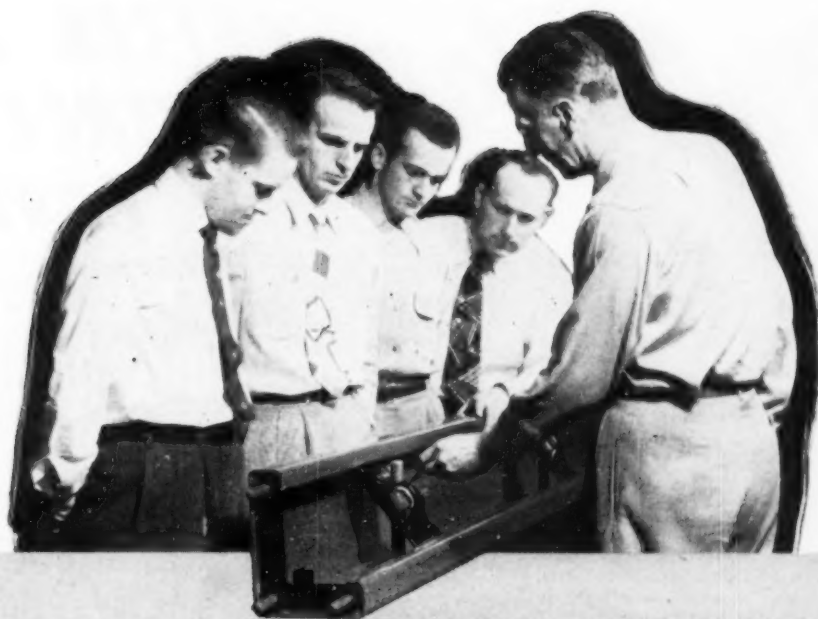
**B-G CONVEYORS . . . REDUCE COSTS, SPEED WORK AROUND THE WORLD**

# Barber-Greene

Aurora, Illinois, U. S. A.







## THE LATEST DEVELOPMENTS IN HIGHWAY AND AIRPORT FORMS

● All paving forms should perform two distinct functions. First, they should accurately confine the limits of the pour, and, secondly, they must act as track, supporting and steering the massive machinery required to prepare the subgrade, spread, finish and cure the slab.

● The ability of Heltzel Forms to best fulfill these two basic functions is the big reason why they are preferred by leading contractors everywhere. For behind the Heltzel name is almost half-a-century leadership in the design and manufacture of steel forms. This "know-how"—has enabled Heltzel to constantly produce practical, workable, "form setter's" forms that set fast, align perfectly, hold steady and firm. And "Heltzel Built" means they're precision fabricated of special analysis carbon-manganese steel, pre-stressed to

withstand heaviest loads without failure.

● The form illustrated above is the latest design of the popular HELTZEL DUAL-DUTY FORM. (Two forms in one for two different slab thicknesses.) It features extra-wide, two-way stake pockets and restyled end supports which add up to the strongest form in the field. The triple-prong slide locking arrangement and single direction wedging gives form setters perfect alignment with a minimum of effort.

● This long experience and constant experimentation make it just common sense to see the Heltzel representative in your area before you purchase form equipment. If you don't already have a complete file of Heltzel Form literature, use the coupon below.

# HELTZEL

## STEEL FORMS

THE HELTZEL STEEL FORM AND IRON COMPANY



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City \_\_\_\_\_ State \_\_\_\_\_

• 5400 THOMAS ROAD • WARREN, OHIO

# HOW to do a

# BETTER JOB of STREET PAVING



Adnun Jr. Model 8 spreading base course of stone. Street is 21 ft. wide and machine laid right to curb without hand work.

## THE NEW ADNUN JR MODEL 8 BLACK TOP PAVER

**H**ERE is a street job in New York State. The Adnun Jr. handled all of the spreading on this from stone base to finished top course. The Adnun Jr. is a highly engineered, quality, precision, tow-type paver that is far superior to the usual hopper on wheels now being used for non-specification work. The advantages of the Adnun Jr. assure greater accuracy in course thickness, improved density and better joints with a material reduction in hand work.

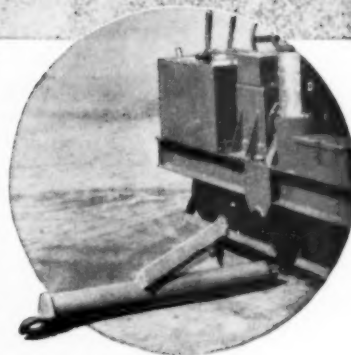
Its ability to maneuver without load saves time on relocations. The powered Breaker Bar in the Hopper assures better compaction. The Oscillating Toothed Cutter Bar, with overlapping action, cuts the course off at the right thickness without troweling fats to the surface and makes a tighter joint without hand work. A smooth course surface which approaches that of larger pavers, results from the Adnun principle of Continuous Course Correction.

These are only a part of the long list of Adnun Jr. advantages in performance and design. You should know all about them. Let us send you a folder on it today.



After stone course was shot with oil, Adnun Jr. laid the asphalt surface in two courses in 7 ft. sections. The machine is here laying the binder.

The Adnun Jr. is easily moved. A removable Trailer Hitch permits lifting the unit with the truck body hoist and towing it anywhere with the paver rolling on its own front wheels.



## ADNUN JR MODEL 8

### BLACK TOP PAVER

**BLAW-KNOX  
COMPANY**  
FOOTE CONSTRUCTION  
EQUIPMENT DIVISION  
1924 State Street,  
MUNDA, NEW YORK



Here the Hydrocrane excavates for a retaining wall. Boom reaches out for extra passes — without moving truck an inch! Quick-set outriggers provide outstanding machine stability . . . even permit the  $\frac{3}{4}$ -yd. clamshell bucket to be handled with a flat boom, fully extended. Every crane function fully hydraulic. Travels up to 50 mph on open road. Simple hand levers — no foot brakes.



**BUCYRUS  
ERIE**

## HYDROCRANE'S built-in reach grabs the *"EXTRA-DOLLAR"* jobs

Bucyrus-Erie Hydrocrane with hydraulically telescoping boom gives you 8 ft. more boom — right at your fingertips. This special extend-retract action means extra dollars in savings on regular jobs . . . extra dollars in profits on special jobs ordinary outfits can't handle. Look:

1. *On erection work* boom reaches between girders . . . hoists concrete buckets, planking, etc., to upper stories . . . saves hundreds of man-hours.
2. *On road work* telescoping boom reaches under branches, over obstructions while handling pipe, culvert, or levelling shoulders . . . moves material into tunnels and low underpasses . . . handles dozens of close-quarter jobs.
3. *On yard work* reaches into boxcars . . . over fences . . . between stockpiles to move material, load trucks, etc., in a hurry.

**QUICK  
CONVERTIBILITY  
TO *HYDROHOE***

By actual stop watch test, crane has been converted to drag-shovel front end by one man in *less than one hour!* And on trenching, telescoping action of Hydrohoe boom cuts lost time moving up as much as 40 percent.

Get the full story on the all-hydraulic Hydrocrane with its many attachments.  
SEND COUPON TODAY



Here the Hydrohoe starts a trench cut. Available with either 12- or 18-inch dipper—equipped with hydraulic ejector that kicks dirt out.

**BUCYRUS-ERIE COMPANY**  
SOUTH MILWAUKEE, WISCONSIN

**BUCYRUS-ERIE COMPANY**  
South Milwaukee, Wisconsin

Gentlemen: ☐ Please send me Hydrocrane literature.  
☐ Please send me Hydrohoe literature.

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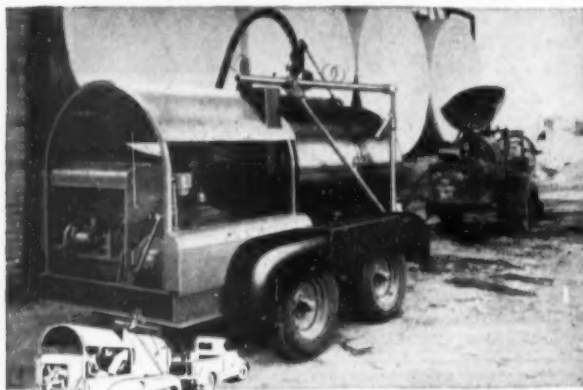
**"You get FAST ACTION —  
to the job...on the job"  
... with Cleaver-Brooks  
oil and bitumen heating equipment!**

**These self-contained mobile units can be ready to pump, heat and circulate bituminous materials in 20 minutes or less after arrival**

*If your job can be reached on wheels, any one of these famous Cleaver-Brooks mobile heating units can save you plenty of time and money. Each can be transported as easily as you drive your car . . . put into operation with minor connections — by only one man! Their proven high efficiency, man hours saved, plus elimination of field problems can be important factors in your profit picture. That's why you'll want to know more about famous Cleaver-Brooks Tank-Car Heaters . . . Pumping Boosters . . . and "Deuce" combination tank-car heater and pumping booster. It's the mobile bituminous team that does more work . . . with faster heat, higher temperatures and with less fuel. Write for details. Cleaver-Brooks Company, Dept. F, 394 E. Keefe Ave., Milwaukee 12, Wisconsin.*



**TANK CAR HEATER** — Shoots steam through tank-car coils at 125 lbs. pressure in 20 minutes or less from a cold start. Can be kept going at full tilt all day. Oil firing plus extra high-heat transfer design, assure extra fuel savings. Turbine-type condensate return means less water required. Available in two-car (28 BHP) and three-car (42 BHP) sizes, trailer and skid-mounted models. Ask for Bulletin RM-110.



**PUMPING BOOSTER** — Heats by direct firing 4 times as fast as steam, recirculates, then delivers bituminous materials directly to distributor. Heats only the amount of material required — not necessary to heat entire car. No steam or water required for operation. Has self-contained fuel and gasoline tanks. Available in two sizes, trailer and skid mounted: No. 1A Booster heats approx. 300 GPM temp. rise 25°-35°F; No. 2 Booster heats approx. 350 GPM temp. rise 45°-55°F. Ask for Bulletin RM-107.



**"DEUCE", COMBINATION TANK CAR HEATER AND PUMPING BOOSTER** — It's a portable steam boiler and direct-fired heater mounted on a single frame. Look at this three-job versatility! "Deuce" steam preheats one car to pumpable consistency while circulating and heating a second car to application temperatures. Same unit also pumps and loads distributor or transfer truck. Ask for Bulletin AD-104.

# Cleaver-Brooks



Pioneers and Originators of Self-Contained Boilers, Tank-Car Heaters, Pumping Boosters, The "Deuce" and "Peak-Temp"



# Here's Why The **MICHIGAN** Tractor Shovel WILL DO MORE WORK FOR YOU!



\* *This Power Train — from engine to tires — engineered and manufactured by Clark*

\* **CLARK TORQUE CONVERTER** — 3-to-1 multiplication factor provides maximum torque *when it is needed*. Precise control in inching and digging.

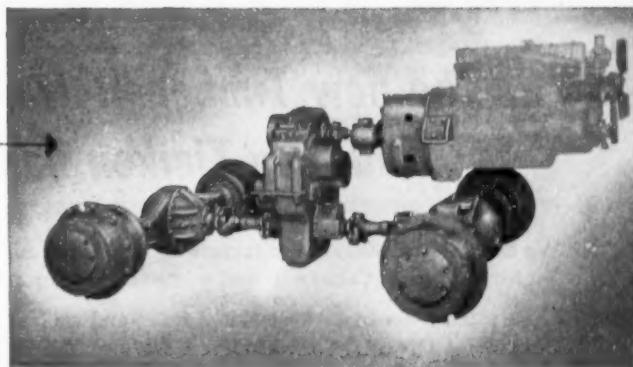
\* **CLARK POWER-SHIFT TRANSMISSION** — no conventional clutch; four speeds forward and reverse—direction control by lever on the steering column.

\* **CLARK PLANETARY DRIVE AXLE** — final reduction in the wheel reduces the torque load on all gears and shafts.

**RESULT** — easier operation, utmost accessibility and simplicity of servicing, highest efficiency in shovel handling.

ADD greater weight and more horsepower than any front-end loaders of comparable capacity, and you see why you can Move More with a MICHIGAN\*.

\*A Trademark of Clark Equipment Company



For full information send for the MICHIGAN Tractor Shovel Fact-Folio — specifications, action photos, magazine article. The coupon will bring your copy.

**CLARK  
EQUIPMENT**



**CLARK EQUIPMENT COMPANY, Construction Machinery Division**  
394 Second Street, Benton Harbor, Michigan, U. S. A.

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# We torture truck axles to

*in the new Timken-Detroit indoor proving ground*  
*...and only Timken has it!*

**We shock-load, abuse, and torture them. Match every conceivable hauling condition. Then add a few brutal tricks of our own!**

**Why?** So you'll know in advance, and for sure, that a Timken-Detroit axle can take the punishment it was designed for. More rugged, grueling punishment than any other trailer axle made!

To prove it, we capsuled a multi-thousand acre proving ground into one room. Here our engineers can put 50 years of experience in building axles for trucks,

buses and trailers to work—subjecting axles and gearing *indoors*, to any *outdoor* operating condition.

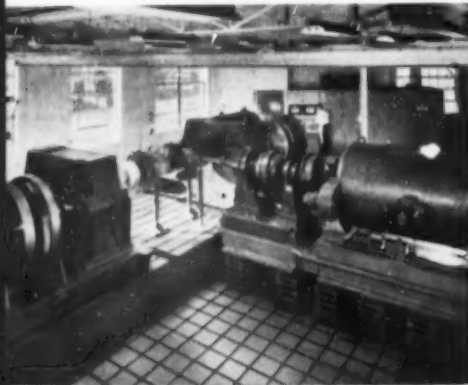
Such exacting research pays off for you in: longer axle life; less maintenance, repairs and downtime; reduced operating expenses. This is why Timken-Detroit axles are preferred by manufacturers and operators everywhere.



**This is our "truck driver."** He works in our "Torture Chamber." Above him are graphs showing speed and torque performance under any operating condition he chooses... soft ground at full load... mountains... express highways or side roads. With special dials, recorders and electronic devices, he actually *drives* the axle with scientific accuracy from his chair!

## How TDA proves axle quality in this "Torture Chamber"

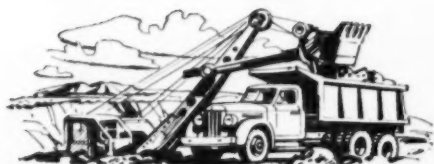
We pick one of our axles at random... then duplicate a hauling condition, hour after hour, day after day... simulating half a million miles of the toughest driving situations in just a few days. Or "invent" a test like going uphill with a full load from California to New York non-stop. There is no other axle testing like it in the world!





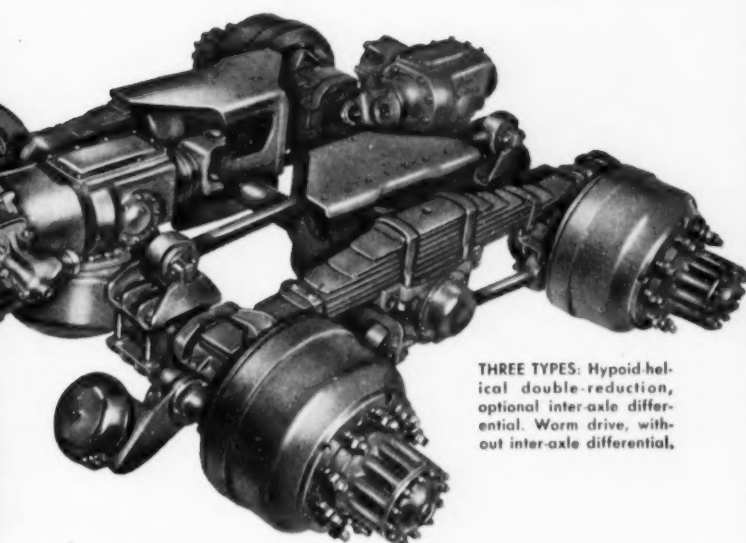
**Hauling wet mix?** You need Timken-Detroit axles—duplicates of axles that have been given the "works" in our indoor testing laboratory. Simulating the punishment the axle would get hitting a chuck hole with a capacity load every 4 seconds, 24 hours a day, month after month! And it's all done to save you money on maintenance and repairs—make you more money every load.

# death



**"TORTURE-TESTED"**  
to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF  
AXLES FOR TRUCKS, BUSES AND TRAILERS



THREE TYPES: Hypoid helical double-reduction, optional inter-axle differential. Worm drive, without inter-axle differential.

## For six-wheeler operation . . . the TDA Tandem Drive Rear Axle Unit

Now—the *lightest weight* tandem drive rear axle unit for heavy-duty motor trucks! And with these features, developed, introduced and pioneered by TDA: (1) Available in 3 types of final drives and 3 capacities. (2) Top-mounted straight-line final drive eliminates propeller shaft angularity. (3) Optional inter-axle differential . . . spur gear design, cab-controlled power-lockout. (4) Torsion flow axle shafts . . . guaranteed for 100,000 miles or three years, whichever occurs first. (5) Hot forged steel axle housing . . . guaranteed for the life of the vehicle. (6) Unit-mounted "P"

series power brakes . . . for longer life, greater economy and efficiency. (7) Cradle ride spring suspension and paralleled torque rod system . . . maintain correct alignment and weight distribution regardless of driving and braking conditions. (8) Exclusive two-piece trunnion tube bracket speeds servicing. (9) Removable torque rod and spring guide brackets . . . for positive alignment, easier replacement. (10) Rubber torque rod bushings and rubber spring seat bushings . . . eliminate metal-to-metal contact. Require no lubrication.



## Increase axle life with Genuine TDA Equipment Parts

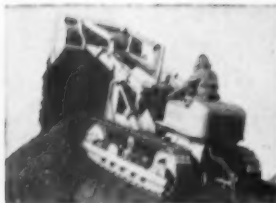
Take no chances with ordinary replacement parts. For sure, dependable factory-type jobs, look to genuine Timken-Detroit axle parts kits—identical to your axles' original equipment.

Each kit is *complete*—gives you everything you need—in

one handy package. Gaskets and shim parts, brake liners, steering knuckles, differential gears—for every size of brake and axle. Order by number from your dealer. Cut labor and adjustment costs. Get trucks back on the road quicker!

Plant at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York • Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania





Backfills coal, sand, aggregate. Has traction and flotation to work right up on the pile.



Excavates, fills, levels. Compact — for work in limited areas.



Backfills ditches, packs and levels ground with 16,200 lb. weight.



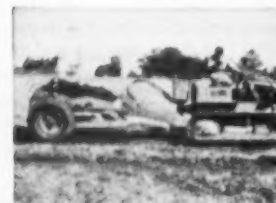
Cleans up rubble with one-cu. yd. tractor-width bucket.



Lifts material where needed. Saves manpower and need for other equipment.



Does sanitary fill work — digs, fills, covers, levels.



Does drawbar work scraping . . . hauling.



Landscapes, grades or slopes lawn areas around building projects.

#### TEN QUICK-CHANGE ATTACHMENTS ADD TO HD-5G VERSATILITY

Bulldozer  
Narrow Bucket  
Rock Bucket  
Crane Hook  
Light Material Bucket

Trench Hoe  
Lift Fork  
Tine Fork  
Rock Fork  
Ripper

## ALLIS-CHALMERS HD-5G Always Busy... because it does so many jobs so well!

Busy equipment is profitable equipment. And thousands of owners are learning every day the year around that there's no more profitable machine on their jobs than the one-yard Allis-Chalmers HD-5G Tractor Shovel.



Loads sand, dirt, snow — any material to dumping height of 9 ft., 1/4 in.

Larger size Allis-Chalmers tractors with shovels and other quick-change attachments offer the same wide utility, the same outstanding performing ability as the popular HD-5G. Choose the one that fits your needs.

1-YD. HD-5G	2-YD. HD-9G	3-YD. HD-15G	4-YD. HD-20G
40.26 drawbar hp.	72 drawbar hp.	109 drawbar hp.	175 net engine hp.
Dumping height* 9 ft., 1/4 in.	Dumping height* 11 ft., 4 in.	Dumping height* 12 ft., 8 in.	Torque Converter Drive Dumping height* 13 ft., 5 in.

\*Height of bucket hinge

# ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.





## TONCAN CORRUGATED METAL PIPE is unaffected by Impact or Vibration

Toncan Corrugated Metal Pipe is strong and flexible. It withstands the day-after-day pounding of heavy loads. It is unaffected by impact, vibration, severe weather changes or shifting soils. It is ideally suited for use under heavy fills or where slopes are steep.

Lightweight, unbreakable sections reduce shipping, handling and installation costs. Toncan Corrugated Metal Pipe can be easily installed in any weather with unskilled labor.

And, here's another advantage. Toncan Corrugated Metal Pipe offers the highest rust-resistance of any ferrous metal in its price class. It is made from Republic Toncan Iron—the ALLOYED IRON containing twice the amount of copper ordinarily used in copper-bearing steels and

irons—plus just the right amount of molybdenum to make the copper most effective in resisting rust.

Ask one of the Toncan Drainage Products Manufacturers listed below for complete engineering data on these low-cost, easy to install drainage structures. Or write to:

### REPUBLIC STEEL CORPORATION

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, N. Y.

*Toncan Drainage Products are made from  
Republic Toncan Iron and Republic Copper Steel*

Corrugated Metal Pipe • Perforated Corrugated Metal Pipe • Sectional Plate Pipe • Sectional Plate Arches • Corrugated Metal Arch-Pipe • Sectional Plate Arch-Pipe • CorWel Subdrainage Pipe • Asphalt Coated Pipe • Asphalt Coated and Paved Pipe.



### Manufacturers of Toncan Drainage Products

DEALL PIPE & TANK CORPORATION  
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BOISE, IDAHO

BERGER METAL CULVERT CO., INC.  
WESTMINSTER STATION,  
VERMONT

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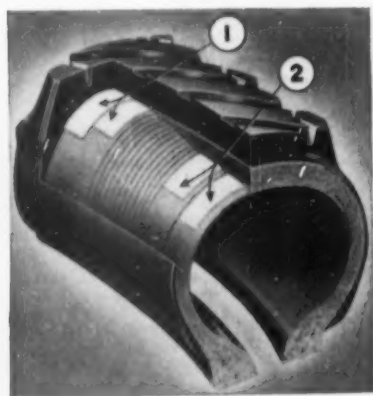
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**Specify B. F. Goodrich tires when ordering new trucks**





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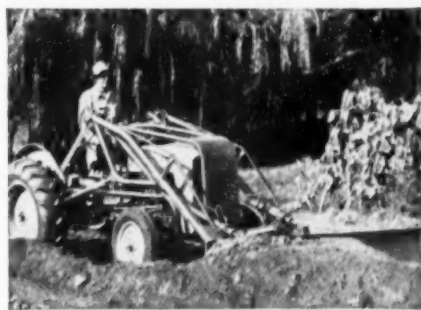
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## ROADS AND STREETS

# Washington News Letter

By DUANE L. CRONK

Now that the much-debated, long-awaited federal highway act has passed both houses and is awaiting the President's expected signature—highway groups in the nation's capitol have begun to sigh with relief.

Labeled "one of the most progressive federal-aid acts ever adopted," the measure provides \$966 million annually - including \$875 million in matching funds for fiscal '56 and '57 compared to the current \$575 million. This breaks down into \$315 million for the primary system, \$210 million for the secondary system, \$175 million for urban routes on the federal-aid system and \$175 million for the interstate system.

\* \* \*

The \$175-million provision for Inter-State highways—the nation's "main stems"—has been the single feature most applauded among Washington observers. Furthermore, the states will have a more favorable matching formula for these funds (40-60 instead of the usual 50-50).

Other provisions include (1) less participation by the Bureau of Public Roads in secondary road projects, (2) availability of \$62.3 million after July 1 for parkways and park roads, (3) money for a study of toll roads and other highway financing, and (4) a new clause against collusion in bidding.

Protection against collusive bidding, for the first time, is spelled out in a highway act itself. The clause demanding a sworn statement from contractors was not recommended by either the Bureau of Public Roads or the American Association of State Highway Officials. Senator Gore of Tennessee, in discussing the bill on the Senate floor, however, insisted that it would prevent "political shenanigans".

\* \* \*

Sentiment among Washington representatives of road contractors, highway officials, city officials, highway users and others is that the federal act is "a big step in the right direction".

There is much praise for Congressman McGregor of Ohio and his subcommittee, which marshalled witnesses from dozens of road and civic interests to support the drive for more road construction.

(continued on next page)

The 52% increase in funds pleases road builders' groups—the American Road Builders Association and The Associated General Contractors of America.

The AASHO sees several of its important recommendations adopted, particularly the new population formula for apportioning funds to the Inter-State system. Motorists' and truckers' groups are pleased, too, with provision of construction funds for the main routes.

What effect will the increased federal aid have on construction prospects for '56 and '57? And on planning in the meantime? Some states have difficulty matching federal funds at the current rate. But, no state has passed up the aid yet.

\* \* \*

State highway officials unanimously supported AASHO's push for the increase. "They wouldn't have asked for more help if they hadn't thought they could match it in the states," AASHO leaders observe. The BPR sees real difficulty in "only three or four states".

Most states will have to seek more state highway revenue than they now enjoy. Their legislators will have to face up to the matching job.

\* \* \*

Highway users, engineers and officials held their annual Washington confab early this month (May 4-6) under the auspices of the National Highway Users Conference. Highway programming, traffic control and uniform codes drew them to Washington for the Fifth Highway Transportation Congress.

Five states—Maryland, Oklahoma, Washington, Colorado, and Massachusetts—were honored for outstanding reports to the public on road plans and progress.

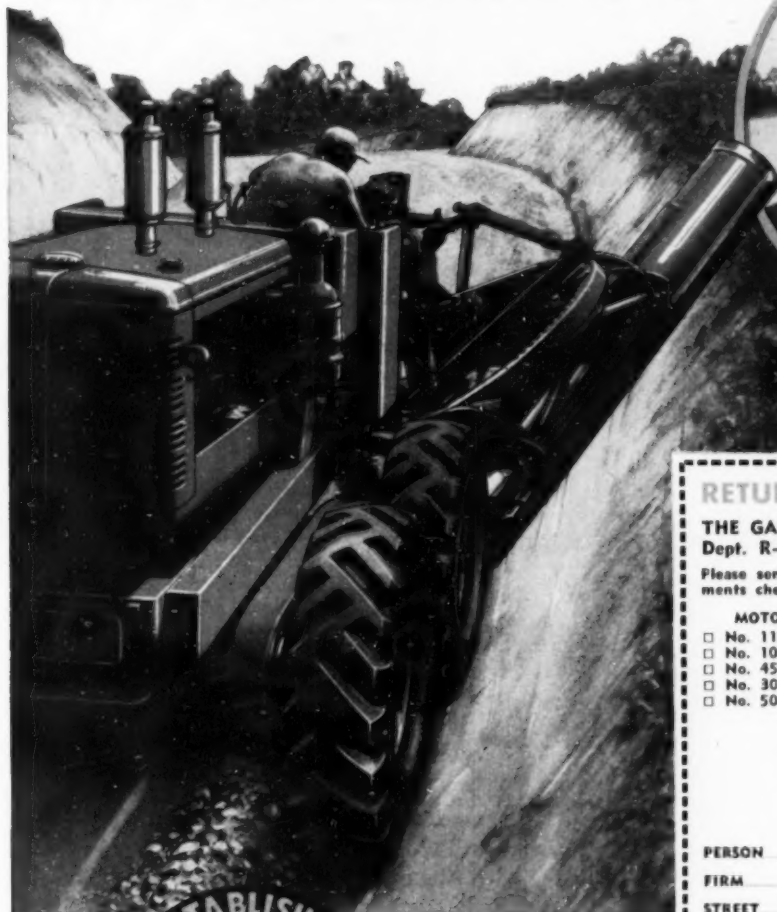
\* \* \*

First report on the Idaho Road Test is on the press. The Highway Research Board will make no comment about the eagerly awaited results. First report will be interesting for its description of design and construction of the test strip and the testing procedures.

Unusual techniques and new devices for measuring deflection and failure will be fully described. Meanwhile, trucks are still rolling over the specially constructed road near Malad, Idaho, to complete the experiment as soon as possible.

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# Roads and Streets in the News

## Gallup poll shows people favor toll roads

A proposed road plan which would include four national super roads—two north and south and two coast to coast—was polled recently by the American Institute of Public Opinion (George Gallup). The sampling of citizens covered in the poll favored the plan four-to-one, according to a news report signed by Mr. Gallup.

This plan, which is without any official backing of any kind, as far as is known to the Roads and Streets editors, was envisioned in glowing terms by this report. It would "revolutionize America's travel and vacation habits, in the opinion of some experts," the report stated. "Distant vacation spots would be brought within easy driving range of the Nations motorists, and the high-speed routes would cut considerably the cost of long-distance travel throughout the country."

The specific vote summary was 71% for the idea, 18% against, and 11% no opinion. The "yes" vote represents an 8% increase in the approval, over a similar question put to a poll list in 1953.

## First step to finance Kansas 234-mile pikes

Two banking houses took steps late in March to set up an underwriting syndicate to bid on \$140 million revenue bonds, for financing the 234-mile Kansas Turnpike. As noted on these pages in previous issues, a toll road is found feasible for a route extending from Kansas City past Topeka and Wichita to the Oklahoma line, where it will tie in with the new toll projects planned for that state (see toll road report in this issue). Smith, Barney & Co. and First Boston Corporation are the bankers.

## Lift bridge to be erected over traffic

Traffic leading into Chicago's busy "Loop" section will be maintained during the replacement of an old bridge over the Chicago River with a new lift bridge. The accompanying artist's sketch shows the scheme to be used for this \$3,250,000 project.

As pictured, the method will be to build the new structure, consisting of a double-leaf trunnion bascule two-truss bridge, in a raised position, allowing traffic to pass beneath the up-raised leaves. The old bridge will then

be torn down and the new structure settled into place in a speedy operation.

The new bridge will be a deck type structure 69-ft. wide over-all, with 44-ft. roadway curb to curb for four traffic lines. Length center to center of trunnion is 210 ft. 4 in. The roadway deck will consist of 5-inch I-Beam-Lok open steel grid. 8-ft. sidewalks will be floored with 2-inch lightweight concrete filled T-Tri-Lok steel grid.

The bridge is designed for one-man operation, in accordance with a recent change-over to this type of operation for all bridges along the Chicago River within the city. The old structure, a Scherzer double-leaf rolling lift bridge, was built in 1895.

## John Butter succeeds Koch in Iowa

John G. Butter, formerly administration engineer, has succeeded E. F. Koch as chief engineer of the Iowa State Highway Commission. Col. Koch has accepted a road building job in South America for Raymond Concrete Pile Co. Mr. Butter has been with the commission since 1919 except for one brief period.

Other promotions announced in Iowa include advancement of Walter

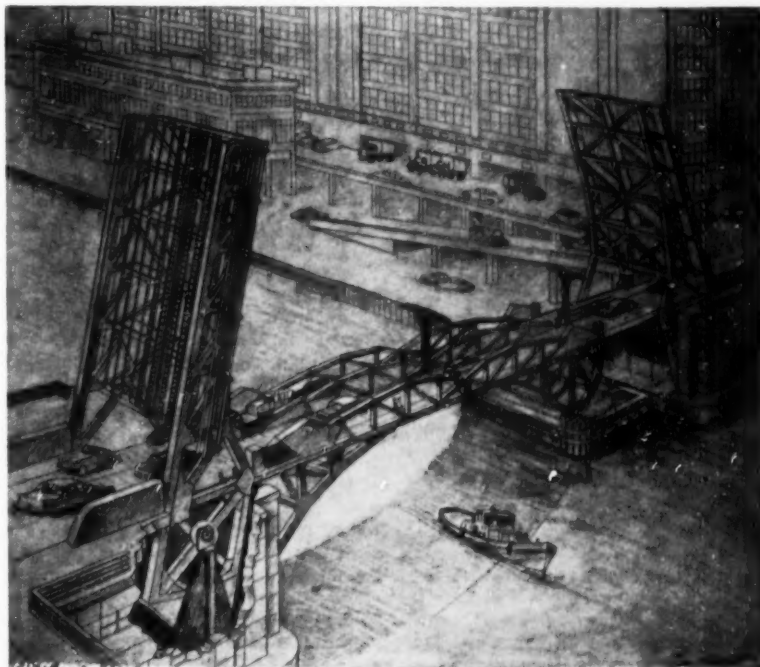
H. Root from maintenance engineer to deputy chief engineer, Jack Reid to administration engineer, R. C. Boyd from design engineer to maintenance engineer, Fred Schneider from location engineer to design engineer.

## Minneapolis has big street paving program

The city of Minneapolis, Minnesota, will place new pavement on more than 24 miles of streets in 1954—more than double the 1953 program. While most of the mileage in the \$2,300,000 job will be in outlying neighborhoods, some 45 blocks of streets in the central business area are programmed, with other blocks likely to be added.

As in other cities, Minneapolis has seen its streets grow old and wear out more rapidly than replacements could be financed. One street to be resurfaced was originally paved with brick in 1898. Replacement or covering up of miles of abandoned street car track zone is part of the picture.

The paving will be financed in various ways, some parcels with assessments on benefitted property, others out of county funds or from payments by the rapid transit company. The transit lines have agreed to pay in \$10,000 for each mile of abandoned



● Showing how new bascule bridge in Chicago will be erected in raised position, to permit traffic over the old bridge during construction.

track, of which there are 92 miles. Some additional paving work awaits financing agreements to be worked out between city, county and state highway department.

### Turnpike group criticized for commercial support

The National Turnpike Association recently formed in Chicago was criticized in newspaper reports on two scores. One was in reference to the dual role of its chairman, Evan Howell, who is also chairman of the Illinois Turnpike Commission. It was claimed that Mr. Howell could not appropriately hold the two positions because of conflicting interests and objectives of the two groups.

The other criticism was on the National Turnpike Association's policy of soliciting \$1,000 life memberships from commercial concerns doing business or hoping to do business with toll roads. In a news report Mr. Howell defended the solicitation by stating that the association is a non-profit

corporation, will file public reports of its collections, and will do business in an open and above board manner to avoid all suspicion.

The association's purpose is to keep everyone interested informed in engineering, legal and financial developments in turnpike construction throughout the country.

William E. Slaughter, chairman of the Michigan Toll Road Authority, whose name has been listed on the National Turnpike Association's stationery, announced that he would file through his attorney a request that his name be removed from that stationery which lists him as a director.

### \$26 million state funds for N.Y.C. expressways

Over \$26,000,000 is budgeted for expenditure by the New York state department of public works for arterial highways within New York City during the next 12 months. This represents the largest single allocation from the \$50 million set aside for ar-

terial work in fourteen cities of New York state. It is part of the \$109 million made available by the state legislature for highway, parkway and grade separation facilities. The 1954 allocation is the largest on record.

Of the \$26 million, about \$14 million will be concentrated on completion of the Major Deegan Expressway which will link the metropolitan area with the New York Thruway to the North.

### Traffic deaths decline

The nation's traffic toll dipped during February, according to the National Safety Council. The figure of 2,470 motor fatalities for the month was the smallest of any month since February, 1951. Deaths for the first two months of 5,370 represent a 1 per cent decline from the same period a year ago.

Cities show the greatest decline in accidents. During the first two months 294 cities had a no-death record.

### Highway study group urged in Michigan

Resolutions have been introduced in Michigan to create a Highway Study Committee. The latest revision of this proposal is SCR 34. The Committee would consist of four senators and four representatives to cooperate with a citizens' advisory panel, made up of highway users and others interested in highway improvements.

### Four states consider turnpike safety rules

Officials of four state turnpike agencies in the east met in March to seek a basis for getting together on traffic safety measures. Meeting at Harrisburg were Edmund Ricker of the New Jersey Turnpike Authority, Russell Deetz of the Ohio Turnpike Commission, Arnold Fisch of the New York State Thruway Authority, and Harold W. Morgan of the Pennsylvania Turnpike Commission.

The committee studied the motor vehicle codes of their respective states and noted points of difference. They also made a night-time trip over the Pennsylvania turnpike to observe rear-end lighting protection on cars and trucks. Rear-end collisions have caused numerous deaths on the eastern turnpikes.

Presently there is far from uniformity in the types and styles of signs, markings and lighting in service on the eastern pikes. Of special concern is the need to achieve an effective type of sign to denote transition from one speed zone to another.

### New Orleans bridge site approved

Permission for the Mississippi River Bridge Authority to build a two-mile-long bridge across the Mississippi River at the Thalia Street site, in New Orleans, has been issued by the Department of the Army.

The Authority, an agency of the State of Louisiana, in applying for the permit proposed construction of a cantilever span, 1,575.33 ft. in length, with a 1,400-ft. clear width for navigation, at a height of 150 ft. above high water. One of the bridge piers will be in the river 555 ft. from the left bank. The structure will cost an estimated \$54,081,000.

A previous application for a bridge at the same site, with a 1,400-ft. span, 1,241 ft. clear width for navigation, 135 ft. above high water, and a pier 700 ft. from the left bank, was rejected in March, 1953, because of hazard to navigation. A later request for a permit for an 1,800-ft. span at Callopie Street, 0.3 miles downstream, was approved. However, it was found by the Bridge Authority that an 1,800-ft. span at Callopie Street involved such difficulties of design and construction as to make it beyond the possibility of financing.

As compared with the crossing schemes previously rejected, the new plans make important concessions to navigation both in increased width and height of the navigation span. A pier still will appear in the river,

but located close enough to the left bank so as to leave sufficient fairway for through navigation and to provide at the same time ample room for maneuvering between the pier and the shore without unreasonable hazard.

Thus, a wider opening is provided where the bulk of traffic and the faster moving traffic navigates, and a clear opening of 555 ft. remains at the left bank for the slower moving craft and vessels, assisted by tugs, maneuvering to berth at or leave adjacent wharves.

The City and State have been considering a bridge across the Mississippi at New Orleans for more than a quarter of a century. The Authority's application pointed out that natural boundaries force any further expansion of the city to take place across the Mississippi River, which is somewhat over 2,000 ft. wide at that point. Modern engineering techniques would normally call for spanning the river by a suspension bridge. However, engineers found that the alluvial and highly compressible soil does not lend itself to construction of a suspension bridge of the dimensions required. Studies therefore have necessarily been concentrated on a cantilever type span which though also involving numerous difficult problems of design, fabrication and erection can be constructed.

## Briefly Noted . . .

Wilfred Owen of The Brookings Institution, Washington, D. C., told highway officials at the convention of the Association of Highway Officials of the North Atlantic States that highway transportation has too long sold an inferior product for economy's sake. In sacrificing ease of travel for economy, he said, the highways of the nation may be compared to Henry Ford's "Model T." When better cars came along, the public showed it was willing to pay the extra cost.

The same kind of competition faces traditional highways today, he said. Toll roads are winning favor over other routes because they are being built by planners who believe that motorists and truckers will pay the extra cost for quicker, easier travel. The success of the New Jersey Turnpike demonstrates, Mr. Owen said, that "we made a mistake to assume that the motorist would be content forever to ride on U. S. Highway 1."

"Too many highway department leaders feel that they aren't obliged to let the public in on what the highway departments are doing," So said Mrs. Virginia Parsons, public relations chief for the Indiana highway commission. This outspoken woman made a brief but colorful report at the recent Mississippi Valley Conference in Chicago, as chairman of the public relations committee session. "The right of way agent is often the first and sometimes sole point of contact," she noted. "He should do his work with skill and consideration of the need for making friends."

"In 1952 over 5 per cent of all trucks and truck-trailers traveling the 361,000 miles of main rural highways exceeded a state load limit. More than 15 per cent of the combinations were

illegally overloaded in some particular."

This statement was tucked unobtrusively into a research report published in Public Roads, December, 1953, entitled "Trends on Traffic Volumes, Types and Weights." The author, Thomas B. Dimmick, is head of the current data analysis unit of the Bureau of Public Roads.

These tidbits of fact take on some significance at this time when costly test roads are being undertaken to find out what loads a pavement will carry.

"Millions For Tribute" is the new imaginative picturization given by the National Highway Users Conference to the price city dwellers pay for congestion.

In noting that urban traffic congestion is one of the most serious and costly problems facing the nation, the Conference bulletin explains that many cities are somewhat in the position of a man who is being blackmailed. Rather than meet the problem head-on, rather than provide means of solving the traffic muddle now, many cities continue to pay millions in tribute each year for costly inconvenience due to inadequate streets and outmoded traffic systems.

The Conference survey report on urban traffic congestion entitled "Millions For Tribute" is a factual, well-documented one and very much worth obtaining for use among leaders in your community.

Dr. George Gallup is at it again. His latest poll of a sampling of citizens shows a 4-to-1 approval of the idea of a network of transcontinental superhighways. This high degree of public enthusiasm is hardly surprising. But how would the poll go with a list of hard-headed investment bank-

ers and insurance company investors, who would be called on to cast a cold eye over the feasibility studies and approve the bonds? Or should we build these roads with Uncle Sam's money and "owe it to ourselves" as an addition to the national debt?

A regulation issued recently by the Bureau of Public Roads, declares that it is contrary to the public policy to permit the use of publicly owned equipment on Federal Aid work. The Bureau has long been an ardent supporter of free enterprise and has required that the vast bulk of Federal Aid projects be constructed by the contract method. The new ruling is another step in the right direction.

The toll road bandwagon is rolling so fast that many have lost sight of a fundamental fact: roads can be built and enjoyed more cheaply as toll-free roads by public taxation.

This is especially true where a pay-as-you-go basis can be achieved, as in California. The saving is still substantial, compared with toll turnpikes, when free roads of comparable design are built with low-interest bonds backed by the credit of a state and retired through tax proceeds and federal aid funds.

Toll roads cost the user trip prices equivalent of 15 to 20 cents or more in gasoline tax per gallon. The motorist and trucker—glad to use any safe, direct, congestion free route—doesn't stop to consider that a fairly hefty share of this cost to him was made necessary by the higher bond interest required by bankers for toll-secured borrowing, by the cost of toll plazas, special-type interchanges, and toll collection and administration, and sometimes by the wasteful haste of construction to get the road into service.

**IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS**



## IT CAN PAY CONTRACTORS TO

# Prospect for Materials by Air

By H. G. MAAS

Washington Commercial Company  
Washington, D. C.

**D**URING the World War II invasion of Italy, Germany, Japan, and Pacific Islands, the men of our armed forces knew much more about the local terrains than did the natives.

Though complete strangers, the personnel aided by "amazing" charts, maps and written instructions, quickly became intimately acquainted with features of the invaded areas. They knew the depth and kind of soils in the valleys and on the hilltops; their stoniness, sandiness, their content of clay and gravel. Our forces knew what areas could be worked with hand tools and what ones required blasting or heavy equipment. They knew where necessary materials of construction were available for roads and air fields and what had to be done to utilize them.

The maps, charts, and instructions that guided our men so remarkably, resulted from a collaboration between military tacticians, aerial photographers and photogrammetrists of the services, and geologists of the U. S. Geological Survey. These experts were organized into a Military Geology Unit in the War Department. The air photography was done for the most part by the air camera reconnaissance planes of the armed forces. However, the work of prospecting for materials was done in an office in Washington where research of the photography and all available background data was done. Here, too, the maps, charts, and written instructions based upon the interpretation work by the geologists, were produced. The brilliant success of the work of this Military Geology Unit during World War II gave photogeology a great impetus and promise of widening usefulness in various peace-time fields.

*Presented at American Road Builders Association annual convention, Atlantic City, January 5-8, 1954.*

The geologists of the oil industry in recent years have used air photo interpretation with remarkable success in world-wide prospecting. Photography from the air shows a geologist trained and skilled in air photo interpretation, the presence of structural features often not visible in ground reconnaissance. Some of the revealing structural features discerned from air photos are: plunges indicated by convergence of beds; faults; dykes, joints of foliation covered by soil; and various rock types.

### Oil and Mining Use

Mining geologists are using air photography with increasing success at home and abroad. One of the world's richest iron ore deposits, in Venezuela, was recently discovered entirely through interpretation by air photos by photogeologists. The workings and development program of the mine were planned through research of the air photos.

Progressive state highway commissions, county road engineers, the Bureau of Public Roads, and others have—of course—used stereo air photos interpreted by trained geologists on their staffs for quite a number of years. This is in connection with engineering geology work on highway design and location. On road projects in some states, source deposits of approved construction materials desirably located so as to reduce hauling costs have been found with the aid of air photo interpretation by staff photogeologists. In such cases, the deposits have been delineated for the benefit of bidders before a highway contract was let. The Highway Research Board personnel, Washington, D. C., has been deeply concerned with increasing the knowledge and use of this technique. Highway construction costs can be cut by its use.

However, little use of such prospecting methods for finding desirably located material deposits has been made by the road contractor and county engineer. This is despite the fact that large possible profits and

savings can result from finding and using such favorably located deposits. The work of successfully coupling a study of ready-made, stereo air photography of an area to research of all available geologic, topographic, soil, and water data on it requires thoroughly trained specialists. Considerable experience in specific areas and photo interpretation skill is also required. The average contractor or county engineer does not have work enough to put such a specialist on his payroll and keep him busy. Thus, the services of a concern making such photogeological work by qualified experts, available on a job basis, fill a real need and become profitable to clients not having their own specialist.

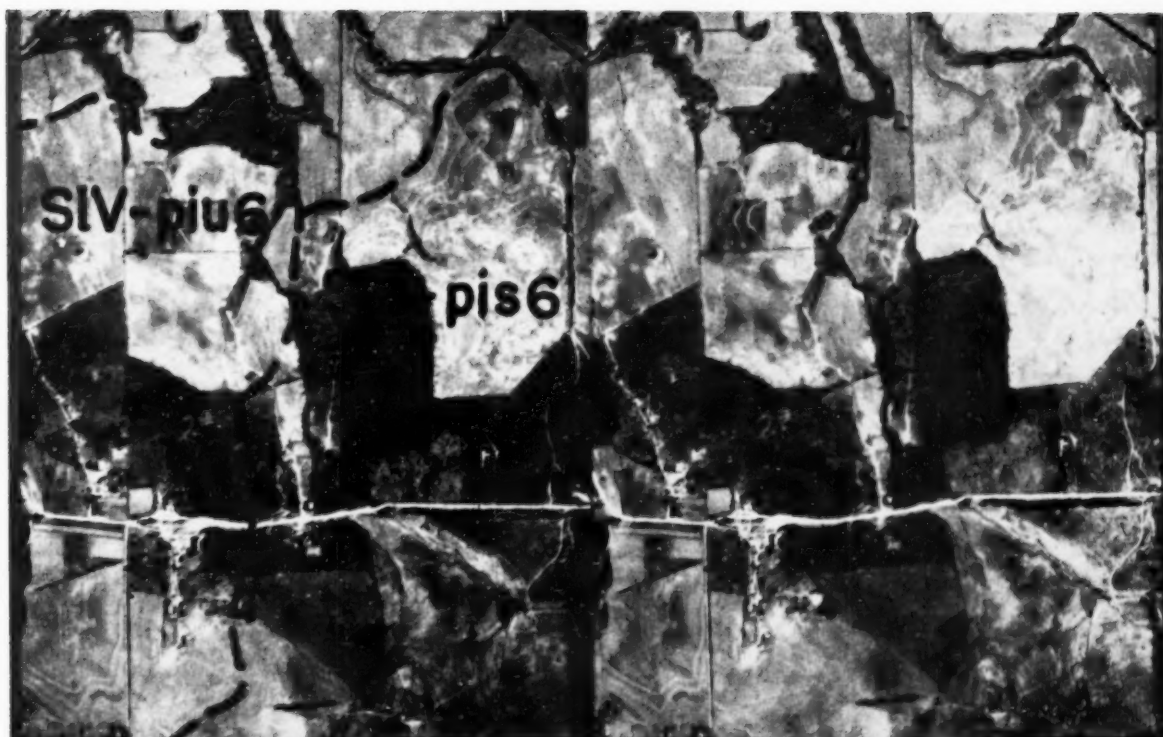
Through the work of such a concern, a county engineer whose area is running short of desirably located gravel and sand deposits is enabled to prospect for new deposits at low cost and in a short time.

### Where Contractor Benefits

A road contractor who has been awarded a contract may find new deposits of acceptable materials that will cut hauling costs importantly because of their short haul and accessibility. This alone could turn a loss or a meager profit into a good profit. Contracts of numerous state highway commissions provide for substitution of acceptable materials deposits for any that may be given in a contract if the contractor can find more desirable deposits that meet specifications. Where such practice is not followed, a contractor should expect to be able to secure official approval for use of specification-meeting deposits that will lower his hauling costs. The public interest would be served by such approvals since lower highway construction costs would eventually result.

A prospective bidder on a projected highway job will find such prospecting work extremely profitable as a rule. Advance knowledge of the most favorably located deposits in a projected road area could give a bidder





● From stereo pair of vertical air photos, which are studied under a magnifying stereoscope by a trained photogeologist to reveal the existence of limestone deposits that might be quarried for road surfacing.

highly advantageous cost guidance when invitations to bid are issued and he prepares his bid.

#### Ground Surveys Costly

The importance of granular materials to road and air field construction projects often makes it necessary to survey an area in great detail for available materials. Great expense and long time are required by the conventional ground reconnaissance methods which are also often inaccurate and unreliable. Frequently it is impossible on the ground to trace the area of a deposit. Inaccessibility, thick vegetation, or lack of cooperation on the part of a land owner may make surveying impossible. It is costly indeed to grope blindly throughout an area, making expensive test borings, getting options or cooperation of land owners, trying to prevent undesirable publicity that could mushroom option prices, and traveling many miles requiring countless man-hours.

When a qualified geologist studies a large area from stereo air photographs by means of a stereoscope, he has none of these problems. The land is laid out before him on his work table. In a reasonably short time, he

can locate and mark the localities where deposits are indicated and where test borings, samplings, and in some cases geophysical tests, should be made. Thus, field work can be concentrated upon localities where deposits probably exist. Also, he can select localities for such field work that clearly show the best accessibility and hence the lowest hauling costs.

#### Arterial route plan for Troy district

A general plan for development of a 39.2 mile arterial route system for the Troy-Watervleit-Cohoes area, was presented by New York State Department of Public Works officials to the municipal and county officials involved.

Estimated to cost \$43 million at current prices the proposed plan provides for modern highway facilities to remedy traffic ills now threatening the economic future of this area.

This plan is similar to plans which have been presented one by one for other municipal areas of New York state. Under a state-wide program set up, Routes contained in such plans, which are agreed upon by all parties

involved, become the official routes to receive fund allocations.

#### Effective "Action" letter used in New York state

Recently in connection with the proposed \$2.8 billion state-wide highway development program suggested in a report to the Legislature, the New York Good Roads Association sent out a letter to a widespread list of citizens and civic and organization leaders.

Headed by the statement "THIS IS LATE AND IMPORTANT!", the letter read as follows:

"The Highway Finance Commission has made its report to the Legislature! (See our attached Bulletin)

"You have been working for a highway program for the past four years!

"The Governor wants to know—your Legislators want to know—how *you personally* feel about the proposals!

"Please exercise your right as a voter—contact your local legislators and tell them to act favorably on the Diefendorf Commission report—and use the enclosed postal card to inform the Governor *personally* that you want action this year for BETTER ROADS!"

# Toll Roads Make More Headlines

*Current and prospective developments in toll highway financing and construction, as reported from state capitals throughout the country, include the following:*

● **FLORIDA:** State Turnpike Authority hopes to start letting construction contracts by July 1 for its projected toll highway to run about 110 miles northward from Miami. All district engineers have been named by the authority and are at work designing the turnpike. Right-of-way acquisition is also being pushed.

Cost estimates have been raised from \$62,000,000 to \$87,000,000 for the project. Target date for completion is set at April, 1955.

Meanwhile, following a meeting in Miami of interested states, announcement was made of the selection of the

New York investment banking firm of Smith, Barney & Co. to conduct a study of the possibilities of financing a \$1,500,000,000 chain of toll expressways from Chicago to Miami through Indiana, Kentucky, Tennessee, Georgia and Florida.

● **KANSAS:** Following receipt of preliminary reports from consulting engineers that a 234-mile toll superhighway could be feasibly financed and construction from Kansas City to the Oklahoma state line, via Topeka and Wichita, at a cost of \$140,000,000, the Kansas Turnpike Authority decided that the studies thus far justified the

drafting of a final report which will be used for issuance of revenue bonds to finance the project.

Consulting engineering firms submitting the preliminary data were Howard, Needles, Tammen & Bergendoff and Coverdale & Colpitts. They said it may be possible to let the first construction contracts this year. Pending the outcome of the final studies, bonds for the Kansas project are expected to be offered in early fall. The issue may run considerably higher than the preliminary cost estimate.

## Who is Right?

● **LOUISIANA:** Opposition to any help from the state highway board for a proposed \$100,000,000 toll highway linking Lafayette and Lusher was expressed by State Rep. E. J. Grizzaffi at a recent board meeting. "If any toll roads are built, let Louisiana do it," the South Louisiana lawmaker argued. "I'm against any New York group coming down here and taking away the rights of our people."

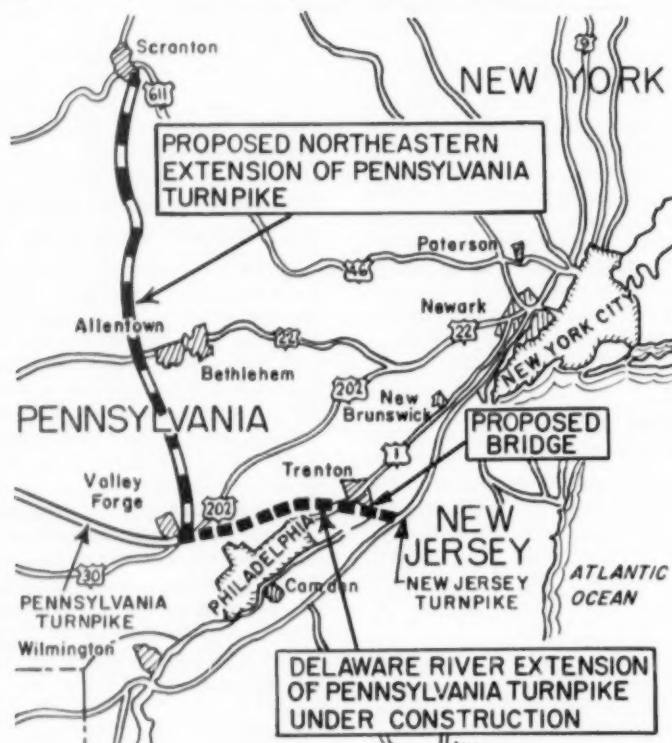
The proposed toll route would run 86 miles, cutting 46 miles from the present distance between Lafayette and New Orleans along U.S. Highway 90. Grizzaffi contended this would make a section of the Highway 90 artery a "ghost town" area. State highway chairman Sherwood Loe told the lawmaker that there "wasn't a chance" the board would be interested in the proposal for the amount of money involved, "because there are too many other projects that are badly needed elsewhere."

● **MAINE:** State Turnpike Authority decided to use a different type asphalt pavement on its 66-mile turnpike extension to Augusta. The decision expected to result in an estimated \$2,500,000 to \$3,000,000 saving from the original pavement cost estimate.

Executive Director William B. Getchell also announced that on the basis of current awards for slightly more than half of the extension's grading and draining, costs are running about 9 per cent less than estimates. The Portland-Augusta section of the turnpike will have a 3-in. bituminous concrete surface, a 4-in. bituminous macadam base, 12-in. gravel subbase, and 20-in. select sand or gravel foundation. The pavement on the older 45-mile Kittery-to-Portland section consists of 7-in. bituminous concrete on a 34-in. sand base.

(Continued on page 46)

## Turnpikes Continue to Spread New Branches



- Showing the new 110-mile Northeastern Extension of the Pennsylvania Turnpike for which \$225,000,000 bond issue was OK'd and ground recently broken under the first construction contract. Also shown is the 33-mile Delaware River Extension around Philadelphia, now well along in construction, and the Delaware River bridge now cleared as a definite project to tie in with a leg of the New Jersey Turnpike near Trenton.



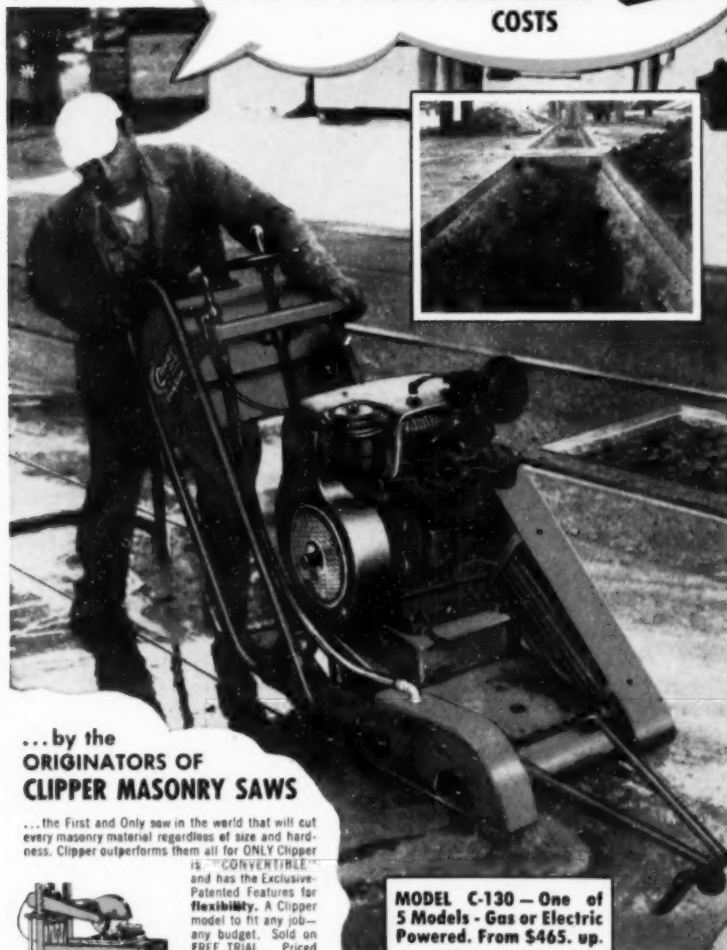
The photos below illustrate typical concrete and asphalt removal practice now being employed by hundreds of Utilities, Municipalities, Contractors and Maintenance Crews in Streets, Floors and Sidewalks. The benefits include lower maintenance costs, lower installation, repair and replacement costs.

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### "Small Sum to Avoid Expensive Mistake"

● **ARKANSAS:** State Highway Director Herbert Eldridge was told by the Arkansas Highway Commission to retain "nationally recognized consulting engineering services" for a feasibility study of a possible toll road between Little Rock and Memphis on U.S. Highway 70.

Eldridge told the commission that from \$15,000 to \$40,000 would be needed for the study, which had been requested by the State Legislative Council. Acting Commission Chairman Cecil S. Lynch observed that "that is a mighty small sum to spend to prevent making an expensive mistake." Eldridge said his department would determine an adequate fee and write specifications for the survey as well as qualifications for the consultants and submit the specifications to all interested firms.

A report by the University of Arkansas College of Engineering recently found that none of several possible routes for Arkansas toll roads would be feasible but that the Little Rock-West Memphis route would be the most nearly economically feasible.

The new-type pavement will be used on all turnpike bridges on the extension. On the older portion, bridges on the turnpike proper are surfaced with concrete.

● **MASSACHUSETTS:** An April announcement was expected from the Massachusetts Turnpike Authority on details of expected May offering of a \$240,000,000 revenue bond issue to finance its projected 123-mile cross-state toll superhighway from outside Boston to the New York state line at West Stockbridge. Hopes are to get construction started by fall.

### Protect Michigan Credit

● **MICHIGAN:** A proposed state constitutional amendment passed by the Michigan Senate and at this writing awaiting House action would safeguard highway tax revenues from ever being used to pay principal or interest on defaulted toll road or toll bridge bonds. Intent of the measure is to insure that receipts from gasoline and weight taxes, the major source of funds for state highway work, will not be used to pay off any bond issues for toll projects that might turn out unfavorably. Nichols introduced the proposal shortly before failing in his efforts to block the sale of \$99,800,000 in revenue bonds for construction of the Mackinac Straits bridge.

Besides the huge bridge project, now under construction, Michigan has three contemplated toll road projects in the planning stages. Two of the turnpike projects alone would cost some \$315,000,000.

● **MISSISSIPPI:** A bill passed by the Mississippi House of Representatives and at this writing awaiting State Senate action would create a State Turnpike Commission to finance and

construct a 4-lane toll highway providing a link between Memphis and New Orleans. The contemplated turnpike, estimated at \$75,000,000 to \$100,000,000, would be financed through revenue bonds payable from toll receipts only. Other projects would be permitted by the bill if found feasible.

● **NEW HAMPSHIRE:** State legislature called itself into special session starting April 6, to consider legislation to give the state the same right of appeal to the courts from the findings of highway layout commissions that is now enjoyed by private landowners whose land is being taken for highway construction purposes.

The session is the first in the state's history to be convened by the lawmakers themselves by signing petitions for the call instead of being convened by the governor. It resulted from criticism of the amount of land-damage awards granted in connection with new toll road construction projects in the state.

### Merge Two Bodies?

● **NEW JERSEY:** The Turnpike Authority, as this is written, was set to market a new \$27,000,000 revenue bond issue to finance its portion of the construction cost of a proposed connection with the Pennsylvania Turnpike. The connection is expected to be in operation by June, 1956. The New Jersey authority's share will include cost of half of a bridge across the Delaware River and a 6-mile roadway from the bridge to the Jersey Pike south of Bordentown.

A bill was introduced in the state legislature to give that body control of the New Jersey Highway Authority, a separate agency which is building the 165-mile, \$285,000,000 Garden

State Parkway toll project from Paramus, Bergen County, to Cape May. "The New Jersey Highway Authority is the only state authority whose bonds (to the extent of \$285,000,000 in principal amount) have been guaranteed by the state," Shershin said in offering his bill. "Article 8, Section 2, Paragraph 3 of the state constitution places the responsibility for protection of the state's credit strictly within the province of the legislature."

● **NEW YORK:** Bills enacted by the state legislature included a measure lifting a \$500,000,000 ceiling on borrowing by the New York State Thruway Authority. The legislation, requested by Governor Dewey, will permit the authority to issue revenue bonds to finance completion of the New York-to-Buffalo toll superhighway and to construct four spurs joining the main route with modern highways in adjoining states. Amount of the additional bonds required has not yet been indicated.

Also enacted was a bill empowering the Thruway Authority to proceed with an acquisition of land for construction of an expressway on Long Island from New York City to Riverhead, and an enabling act for construction of a thruway spur between Suffern and the New Jersey state line.

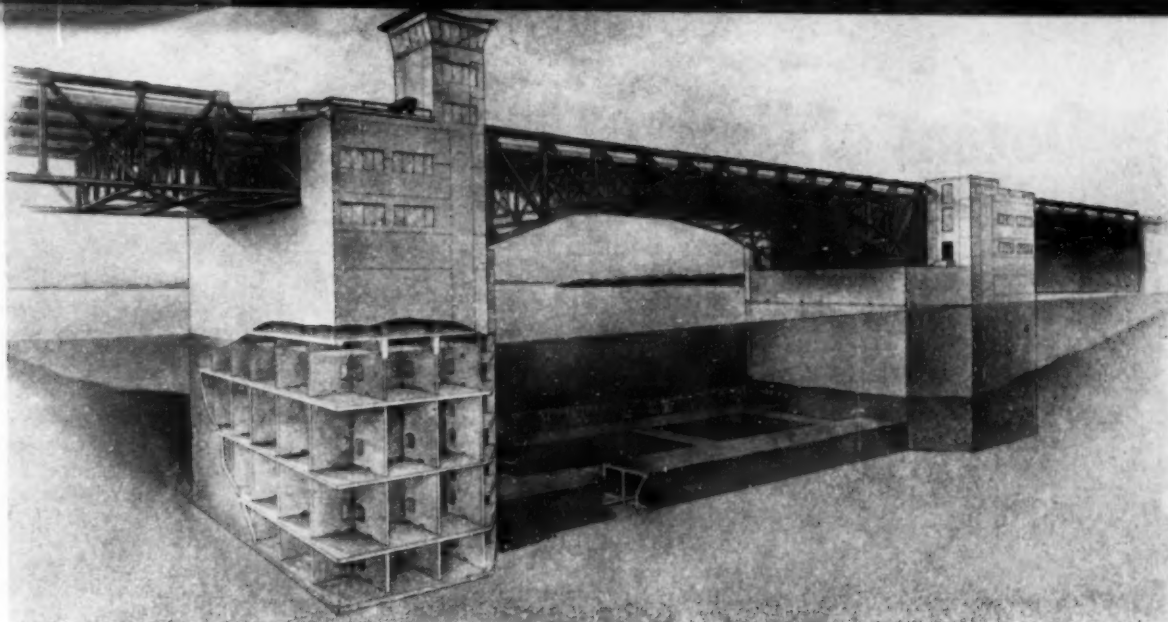
The legislature also authorized preliminary studies of possible toll expressways between Albany and Canada; along the southern tier counties; and from the vicinity of Binghamton to the Watertown area.

Meanwhile, the State Thruway Authority announced June 24 as the target date for official opening of the first section of its toll superhighway from New York to Buffalo. A few sections now are open to traffic on a toll-free basis. The initial 110-mile section to be opened on a toll basis will run from Verona, west of Utica, to a point south of Rochester.

### Electronic toll booths

New electronically controlled equipment at toll booths will expedite weighing, recording, classifying of vehicles and toll collection on the Pennsylvania turnpike system. This equipment, designed by the International Business Machines Corporation, will be installed in a change-over program by autumn, 1955. Electronic devices will count axles on each car or truck, and perform other routine work in a manner permitting speedier handling of traffic past the booths. Data will also be automatically collected for use in traffic analysis work for other management and planning purposes.





● Showing the cellular pier design and under-water ties.

## Semi-Floating Piers For Seattle Bascule Bridge Span

*Semi-floating cellular piers of unusual design are a feature of a 4-lane bascule bridge to be built across the Duwamish River at 1st Avenue South in Seattle. A \$1,387,000 contract for piers and foundations, awarded to General Construction Company, Seattle, marks the start of this 6½ million dollar bridge and approach project.*

**D**ESIGN, development and plans were by the Seattle engineering department under the administration of W. E. Parker, city engineer. Construction will be under the Washington state highway department, W. A. Bugge, director of highways.

The semi-floating cellular pier construction will be connected under the channel bottom by two reinforced concrete cellular struts. Another design feature is the provision for the effects of varying tide levels. Two loading ports at extreme low tide will allow flow of water in and out of an impounding chamber. As the tide rises, water flows into the tidal chamber above, balancing the tendency of the rising tide to life the piers, and thus maintaining the 85% bouyancy upon which the design is predicated.

The initial contract calls for fabrication of the first lower unit of the pier and strut assembly in a drydock

or other type of graving dock facility, the units then to be launched and towed either to a fitting-out pier or the approximate permanent bridge site.

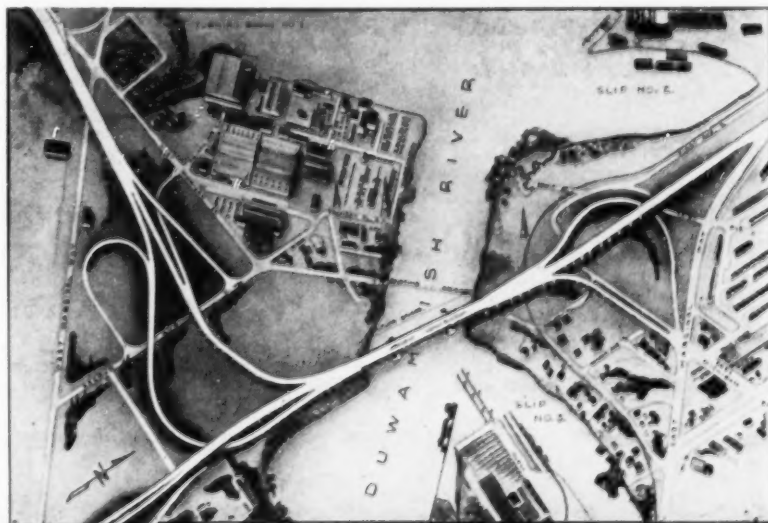
A second construction stage entails

further building up of the pier shafts to allow the pier assembly to sink lower into the water. This will place the connecting struts deep enough under the water surface to permit passage of river craft after the pier assembly has been swung into final position.

The pier shafts then will be further built up in place until the pier has been landed in its permanent position on the floor of the channel. The pier sites will be dredged to allow placing of each pier at the desired depth. Backfilling to the design level of the channel will be accomplished with material obtained from upstream dredging.

Award of contract for the main bascule piers will be followed by call for bids for the bridge superstructure and approaches, about mid-1954. Completion is set for late 1955.

● Seattle's new 1st Avenue Bridge will have complex expressway-type approaches.



# Dozens of Uses • Thousands of Users

## Prove Ability, Versatility of the Model D



50 Brake hp • 8,800 lb (bare)  
Four speeds forward to 25.6 mph, reverse to 3.3 mph

The thousands of satisfied owners are still finding new uses for the able and versatile Allis-Chalmers Model D Grader. It has proved again and again that it has the power and capacity to do outstanding work on both construction and maintenance.

Usefulness of the Model D is multiplied by several easily mounted attachments: hydraulically controlled rear-end loader, shoulder maintainer that is interchangeable with the loader, scarifier, both V-type and blade snowplows.

### MORE POWER, NEW FEATURES, LOW COST

For even greater performance ability, power for the Model D has been boosted to 50 brake hp. Also,

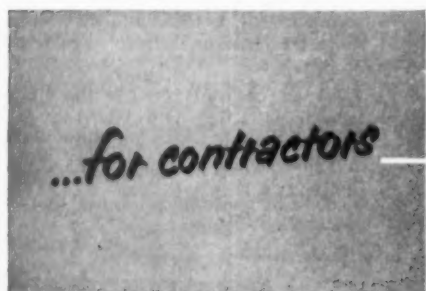
leaning front wheels and power circle turn now are available (optional). With these and other big-grader features such as tandem drive, ROLL-AWAY Moldboard, tubular frame and hydraulic blade lift — the Model D's original cost still is but one-third that of a large grader. Operating costs are low, too.

Your Allis-Chalmers dealer will be glad to demonstrate what the versatile, economical Model D can do for you.

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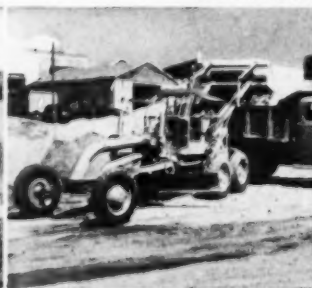
Finish grades between forms on road and street construction.



Levels for home building, marking lots, play areas, etc.



Terraces, builds diversion ditches, does miscellaneous grader work.



Loads sand, gravel, dirt, any material, with  $\frac{3}{8}$ -yd. bucket.



Rough grades, spreads and cleans up on street or road construction.



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*...for county and  
state highway  
departments*



Scarifies with plenty of down pressure, accurate hydraulic control.



Mixes thoroughly, with rolling action of ROLL-AWAY moldboard.



Cuts and cleans ditches, slopes banks, grades shoulders.



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Loads sand, dirt, snow—any material—to trucks.



Keeps roads in shape the year-round—clears snow in winter.

*...for cities  
towns and  
townships*



Maintains streets and alleys, park drives, playgrounds.



Handles light construction on streets, roadways, etc.



Backfills ditches, packs and levels ground, loads excess dirt to trucks.



Removes weeds from street sides and alleys, loads or hauls away.



Windrows snow with blade, or plows with V or blade plow.



Loads snow from gutters, maintains stockpiles, handles bulk materials.

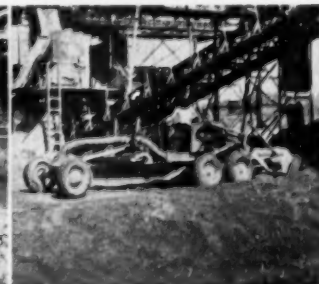
*...and others*



Builds and maintains access roads for quarries, cemeteries, etc.



Clears and loads snow at quarries, storage yards, parking areas.



Grades, handles bulk materials around industrial plants.



**N**YLON in the U. S. Royal Con-Trak-Tor helps you through the heavy going—*keeps you on schedule!*

### ALL-NYLON STRENGTH

The Con-Trak-Tor's Nylon cord body withstands murderous impact... means that you get every hour of tire life built into this great U. S. Royal tire.

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*Prove it. Put the Nylon U. S. Royal Con-Trak-Tor to work—watch your pay loads stay on the move. Your U. S. Royal Dealer has it in your size, for your job.*

# NYLON...Keeps Pay Loads Moving!

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## CON-TRAK-TOR

FULL LUG



UNITED STATES RUBBER COMPANY





## Tentative findings on Minnesota road financing

Important "tentative" conclusions regarding Minnesota highway financing are found in a recent 32-page report by the Public Administration Service. The report, entitled "Basic Considerations in Financing Minnesota's Highways," is described as the "final segment of the reporting that is practicable" in advance of the completion of the highway needs study being made by the Automotive Safety Foundation. Among the tentative conclusions are:

1. Local jurisdictions, and especially municipalities, are entitled to a larger share of road user taxes;
2. Road users should pay a larger share of the total cost of highways;
3. Some types of heavier vehicles should contribute a larger proportion of such revenues;
4. The constitution should be amended "to eliminate provisions unduly restricting realistic solutions to highway problems" and to provide a single state highway fund for all highway user revenues with the distribution of highway revenues to local jurisdictions a statutory rather than a constitutional matter; and
5. Present highway laws should be revised "to minimize ambiguity, contradiction and what is in effect special legislation."

The conclusion regarding the highway users' share of road costs is derived from an earnings credit analysis. The conclusion regarding tax payments by heavy vehicles is derived from an incremental cost analysis. In neither case does the report include supporting data. The report points out that these tentative determinations are subject to change when complete data on highway classification and needs become available from the needs study.

● The Nevada Highway Department has disclosed that red stop signs soon will be made standard on Nevada's highways. Nevada's decision to replace yellow signs with those which are red in color came on the heels of similar action by Oregon and Washington highway officials. The new signs will be completely reflectorized for better night visibility and will have a red background with silver letters and borders.

● Brig. Gen. E. C. Itschner has been appointed Assistant Chief of Engineers for Civil Works, U.S. Army, with headquarters in Washington, D.C. He will direct the Corps program of harbor, flood control and multiple-purpose projects.

## MODEL 54 ROADMIXER



**mixes 50 miles  
of soil-cement  
at Edwards  
Air Force Base**



▲ Model 54 Roadmixer mixing native or existing soil with cement. Cement was deposited on windrows by a Pettibone Wood Cement Bulker.



◀ Bulker spreads cement while Model 54 Roadmixer processes an adjoining windrow. Bulker spreads cement at the rate of 15 to 80 lbs. per lineal foot (official U.S. Air Force Photo).

By adopting mechanized roadbuilding techniques, Fredericksen and Kasler, contractors on this job, constructed 50 miles of mix-in-place, cement-treated base, bituminous-surfaced roads and streets in four months.

Key machine in the base preparation set-up was a MODEL 54 ROADMIXER.

Using native soil (decomposed granite particles and drift sand), mixed with cement, the ROADMIXER produced approximately 1,000,000 square yards of soil-cement stabilized base. Mixed at proper moisture content and compacted to maximum density, it produced a base with high resistance to failure under heavy traffic.

If you want long life from your wearing surfaces, stabilize the base with soil-cement—and mix your soil-cement with a Model 54 ROADMIXER—the fastest, largest production, most economical method of base stabilization.

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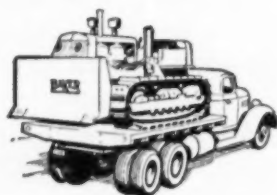
## New Baker 15X—with 102 drawbar hp— combines peak yardage with portability

Proved on the famous 9X, Baker's revolutionary Frame-Mounted, No-Pushbeam Dozer design is already rolling up yardage records on the new, powerful 15X.

Here is a Blade 51" high but *only* 96" wide . . . portable over any highway, day or night, without special permits . . . that rolls up payloads with the capacity of a standard width blade. Here is a Blade mounted closer than ever before to the radiator—a simple, *rugged* design that reduces front end weight, and provides a center of gravity that puts more weight and horsepower to *work*. Engineered for *balance*, the Baker 15X Dozer

permits drawbar work with the blade left *on*—without excess wear on front-end truck bearings.

See the powerful, new Baker 15X—see it in action, where you can watch its *faster bite*, *quicker oscillation*, and *payload punch* that means *more profits per yard*. Ask your Baker, Allis-Chalmers Dealer for a demonstration!



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## Meetings Ahead

FIFTH HIGHWAY TRANSPORTATION CONGRESS—Sponsored by National Highway Users Conference, Washington, D. C.; May 4-6.

NATIONAL ASSOCIATION OF COUNTY OFFICIALS—Conference and Equipment Exhibition, Ak-Sar-Ben Coliseum, Omaha Nebraska; June 9-12.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—annual meeting, Schroeder Hotel, Milwaukee, Wisconsin; June 9-12.

AMERICAN SOCIETY OF CIVIL ENGINEERS—Summer Meeting, Chalfonte-Haddon Hall, Atlantic City; June 14-19.

UPPER PENINSULA ROAD BUILDERS ASSOCIATION—Annual Meeting, Keweenaw Resort, Keweenaw County, Michigan; June 16-18.

CORNELL UNIVERSITY ANNUAL SCHOOL FOR HIGHWAY SUPERINTENDENTS—Cornell University campus, Ithaca, New York; June 21-23.

PUBLIC WORKS CONGRESS—and equipment show—American Public Works Association, Municipal Auditorium, Atlantic City; September 19-22.

## Publications Received

EFFECT IN CONCRETE OF PELLET AND FLAKE FORMS OF CALCIUM CHLORIDE.—Bulletin No. 75 issued by the Highway Research Board, consisting of papers on this subject given at the Board's 32nd annual meeting, January, 1953. For copy address the Board at 2101 Constitution Ave., Washington 25, D. C.

RESEARCH NEEDED IN GEOMETRIC HIGHWAY DESIGN. Special report No. 12 includes statements outlining areas for large and small scale research on different phases of 26 selected subjects, for which data are needed in highway design. Embodies the report by D. W. Loutzenheiser, Chairman Committee on Geometric Design of the Highway Research Board, presented at the Board's 32nd annual meeting, Washington, January, 1953. Copy available by addressing the Board at 2101 Constitution Ave., Washington 25, D. C.

RIGHT OF WAY PROBLEMS. Bulletin 77, Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. This 72 page bulletin, representing the annual report of the Board's Committee on Land Acquisition and Control of Highway Access and Adjacent Areas, comprises four noteworthy papers on aspects of the subject.

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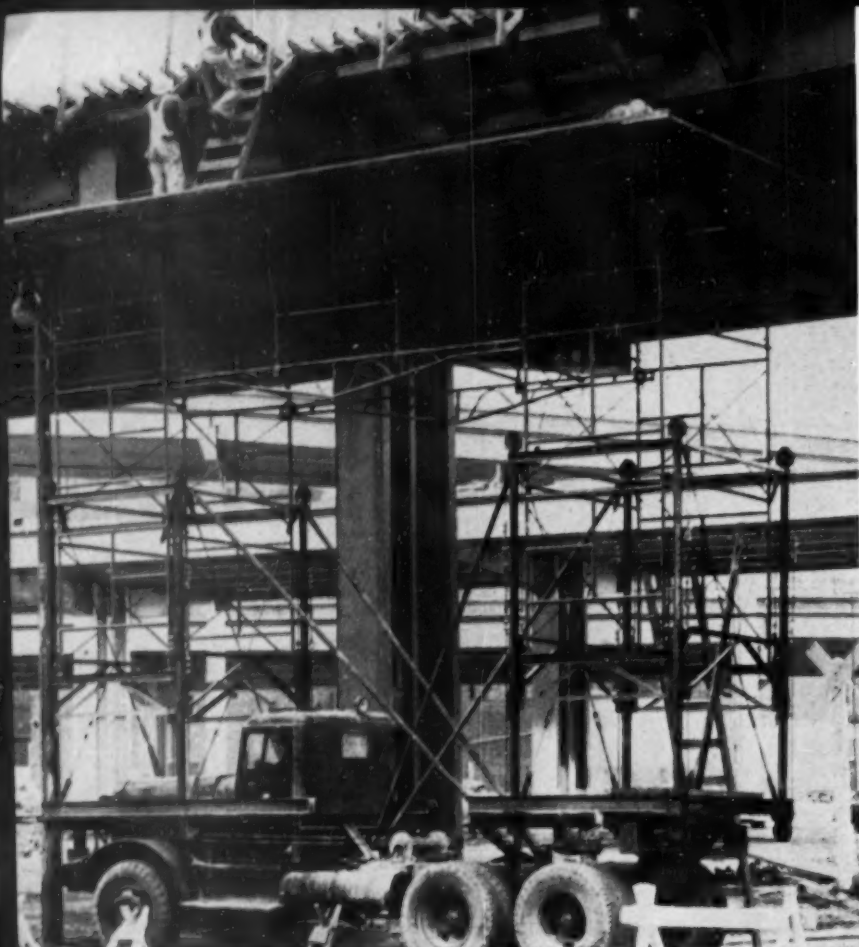
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53





● Showing Atkinson's mobile scaffolding in service, and rear view showing how hoist cable is threaded horizontally.

### Portable scaffolding unit has adjustable legs

To cope with the problem of moving a large, portable telescoping scaffold around over an uneven terrain as well as having it easily and instantly adjustable for height, equipment engineers for Guy F. Atkinson Co. designed and constructed this rig.

The dimensions of the deck are, roughly, 14x28 ft. and it may be adjusted in height from about 12 ft. to 40 ft. At heights in excess of 25 ft., however, the truck bed is steadied

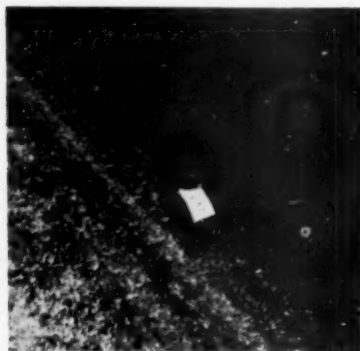
with timber shores. A hand windless is provided which enables a single operator to drive the truck and adjust the altitude of the scaffold at will.

The rig is now in use on a freeway project in San Francisco adjacent to the San Francisco, Oakland Bay Bridge.

### Piece of paper makes good asphalt edge marker

How to quickly and cheaply mark off the edge line, as a guide in putting down asphaltic mix with neat edges,

## Job & Equipment Ideas



● Paper marker for asphalt pavement edges.



is a detail that isn't always properly solved. And some of the methods used are cumbersome.

Where the work is such that a chalk or string line can be dispensed with—as on many intermediate type jobs—why not just tear off part of a newspaper page, fold it once or twice, and tuck it partly under a little dab of mix located along the edge line?

This is the trick observed (see accompanying photos) on a Minnesota state highway resurface job recently. District engineer W. L. Hinderman of the Asphalt Institute, Minneapolis, recommends it highly as one of these simple and ingenious things that help get good looking work. The eye can pick up the paper strip several hundred feet away. A marker every hundred feet or so suffices, either for blade mix or machine laying.

### Specially equipped dozer helps prevent rock slides

In connection with the \$4,122,382 contract to widen and reconstruct the Waldo section of the Golden Gate Freeway—the Marin County approach





to the San Francisco Golden Gate Bridge—Guy F. Atkinson Co. engineers were faced with the problem of trying to prevent rock slides occurring where excavating and grading was in progress parallel to the existing roadway. As a remedy, as illustrated, a scraper blade was fastened onto the rear boom behind a bulldozer, and the blade used from time to time to scoop loose material away from the edge of the grading site.

### Tip on pushing those big boulders

Most dozer operators learn instinctively that when you cannot shove a big boulder by a straight push, you can make use of the lever principal by jockeying the boulder at the corners—as shown in the accompanying picture.

This operator of a Caterpillar D8 with No. 8U Dozer is wrestling a boulder on a road relocation job, Highway 26, near Palisades dam in Idaho. Kiely Construction Company is the contractor. The stone here is Andesite, which weighed up to 80 tons per boulder and required careful handling due to the hazard of rolling onto equipment working on the adjacent fill.

### Scraper scoops up rocks on the run

Normally an earthmoving tool, a D Roadster Tournapull scraper was pressed into service as a rock-handling machine by the crew of D. W. Winkelman Co. of Syracuse, N. Y., on their section of the New York Thruway.

Their problem was how to get rid of rock and niggerheads that remain when shouldering operations are completed, and do it economically.

They first windrowed the rocks to the center of the completed slab with a motor grader. The scraper then picked up the rocks and hauled them to a waste area, aided in the pick-up by attaining a speed of 20 to 25 mph. By lowering the blade so that it "floated" on the roadway, it scooped up the windrowed rocks on the run. Since rocks won't boil, there was no necessity of trying for a bigger load by pushloading. Low costs are claimed for this trick, as publicized by the scraper factory. Data not available on wear and tear.

● Air drills are finely machined tools costing about five times as much per pound as a shovel or dozer. They deserve better care than they usually get.



● How loose rock is pulled back from the top of slopes above existing roadway.



● When the big ones don't budge, nudge them at the corner.



● Scraper hitting rock windrow at high speed.

# GRAVITY DUMP



## SIMPLE BODY RELEASE LEVER WORKS INSTANTLY

**1** Body release lever is located in cab to left of steering wheel. Lever engages toggle linkage to latch hook on chassis . . .

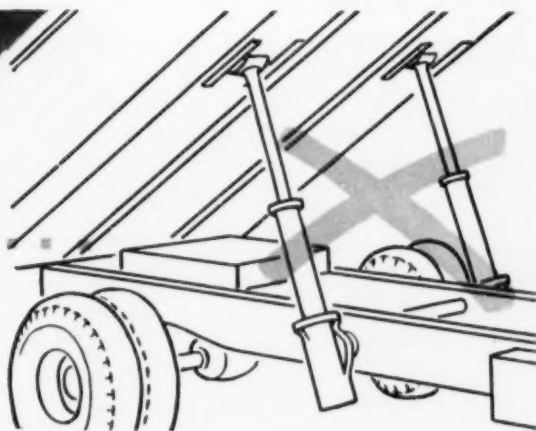


**2** Trip rod instantly releases latch hook from body latch seat on the tilting Dumptor body. Gravity dumps load instantly as . . .



**3** Body rolls on heavy-duty rockers. Snub chains attached to big coil spring shock absorbers check body at 70-degree tilt.

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have no slow-working body hoists. Operator trips the body-release lever . . . and gravity dumps the 6-yard load in just one second. It's as simple as that!

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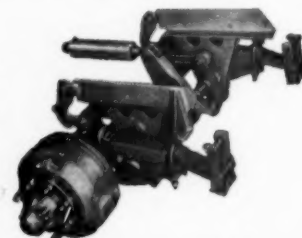
Here's how Hydro-Trac works. From its normal 50-50 axle load distribution, weight can be shifted hydraulically by cab-controlled pump which transfers up to 60% of the trailing axle's load to the driving axle... supplying up to 80% of a dual-axle drive's traction on ice, snow or muddy roads.

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dump bodies and hydraulic hoists



Galion's Model 12 contractors bodies are familiar sights on big construction projects . . . where schedules are dependent upon equipment reliability.

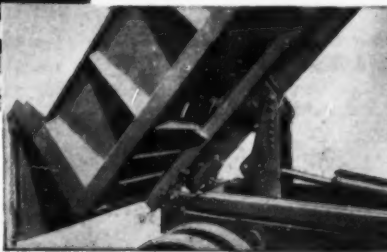
Heavy-duty Model 880 hydraulic hoist easily lifts 10½ to 15½-ton loads.

Yards, tons, pounds . . . gravel, sand, dirt or rock . . . no matter how much you lift or what you haul, Galion Allsteel equipment works efficiently—day in and day out. This, naturally, means bigger profits for you.

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## COURT DECISIONS THAT AFFECT YOUR JOB

### Injuries to boy who stole dynamite

By Albert Woodruff Gray

A child took several sticks of dynamite and a number of caps from a contractor's truck lawfully parked on a highway. The explosives were given by this child to another who was subsequently injured.

Denying to the representatives of the injured child a recovery of damages from the contractor, a West Virginia court held in a recent decision.

"We cannot say that this road contractor was bound to anticipate or reasonably expect and could have foreseen that the dynamite and caps would be stolen from the truck. Neither can we say that the contractor should have anticipated that this boy, after stealing the dynamite, would carry it to his home and give it to some other child who while playing therewith, would explode it.

"The use of dynamite in the prosecution of the construction was proper. The truck was parked where it had a right to be. Most certainly the injury would not have occurred had the theft not taken place or had the dynamite not been carried away or 'procured' by the injured child from the one originally acquiring the explosive. There we think, clearly and definitely, are breaks in the casual chain—intervening causes."

\* \* \*

*McKinney v. Miller*, 75 S.E.2d 854,  
West Virginia, May 26, 1953.

### Contract provision for government interference

A contract for the construction of street improvements in Long Beach, California, contained the provision,

"In the event the contractor is prevented in any manner from a strict compliance with the plans and specifications herein referred to, due directly or indirectly to any Federal law, valid rule or regulation as an incident to any national emergency, in addition to all other rights and remedies to the parties, the city may, by resolution of the City Council, suspend performance under the contract until the cause of the disability is removed, renegotiate the contract by extending the time for performance or by making changes in the character of the work or materials

(Continued on page 64)

# NORTHWEST



NO STUTTER • NO RESTARTS • NO DIPPER JUGGLING

MANY people have wondered why a Northwest is so fast. Northwest operation is so smooth that it doesn't look fast. Get on a Northwest and feel that Crowd bite into the rock! Count the trucks!

A Northwest doesn't waste time! It's a real Rock Shovel — no stutter — no restarts — no dipper juggling either in the bank or in getting the load into the truck. The cycle is smooth. Operation is easy. The Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste. The swing takes hold smoothly — no jerks, no grabs — the dipper is up and out — over the truck and back — up and out — over the truck and back minute by minute, hour after hour! — That's why you see big output figures in connection with Northwests.

Northwest equipment is profitable equipment to own. That is the reason why one out of every three Northwest Shovels sold is a repeat order in the hands of a successful contractor.

There are many other advantages you should ask about.

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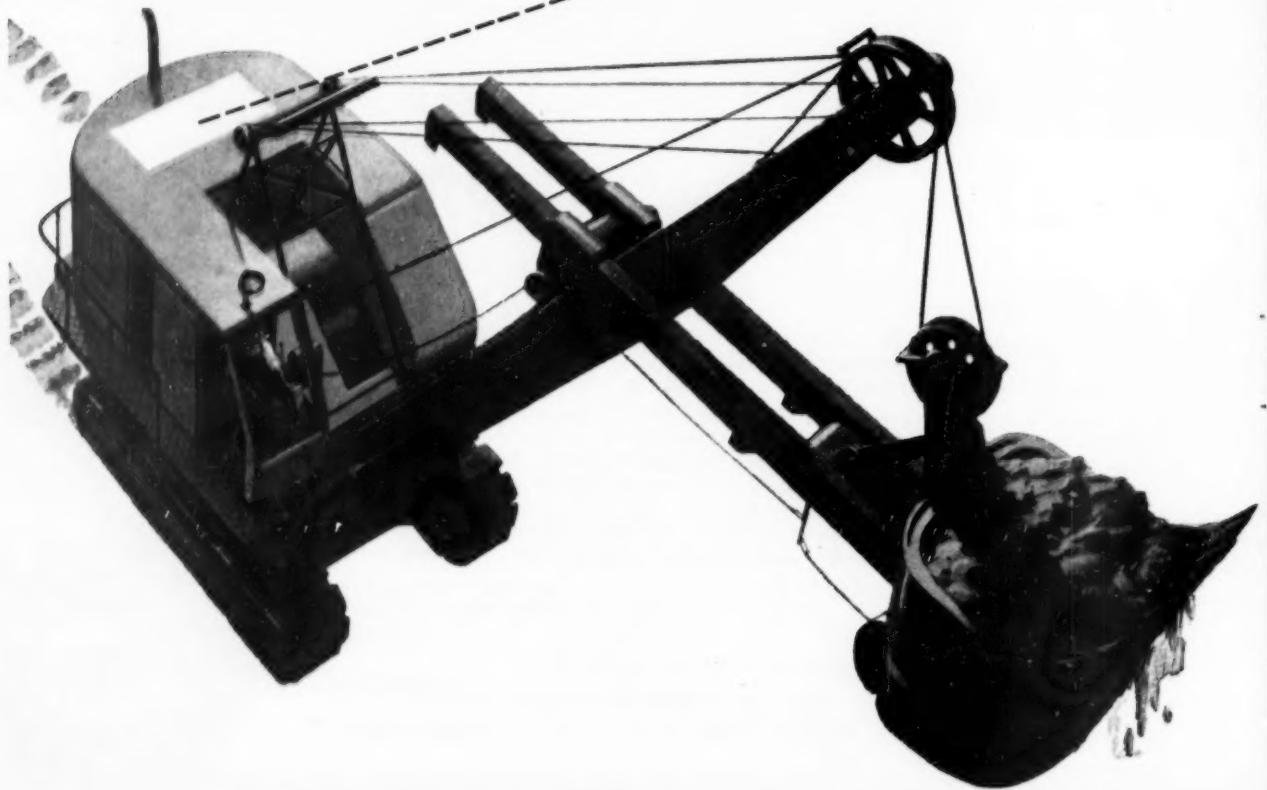
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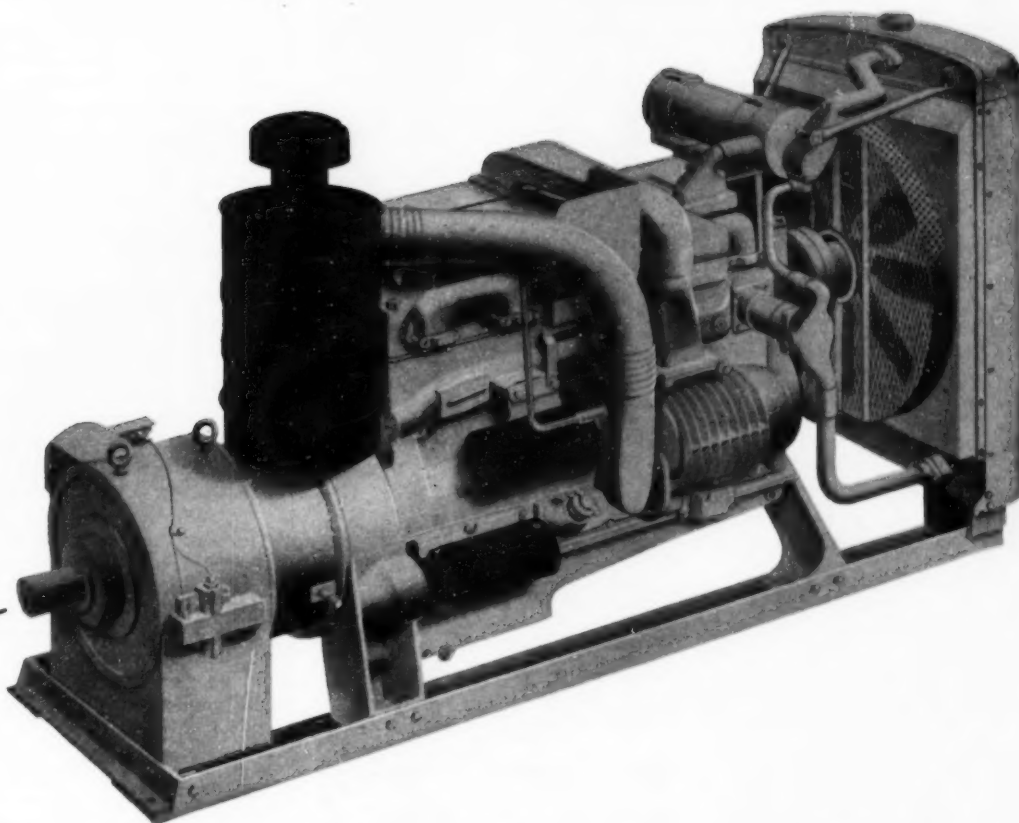
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# **Cummins Diesel - torque converter package speeds work cycle as much as 30%**

**Gives full utilization of horsepower, minimizes shock**







## loads, adds to life of shovels, cranes, and draglines

Cummins Torque Converter Packages give smooth steady power over the entire digging or working cycle. Even where digging is the toughest and power requirements fluctuate widely, the Cummins Torque Converter maintains power without lugging, stalling or overspeeding. Crane work, too, can be speeded because loads can be handled more smoothly and accurately.

The output of the Cummins Torque Converter Package is measured by an output shaft governor

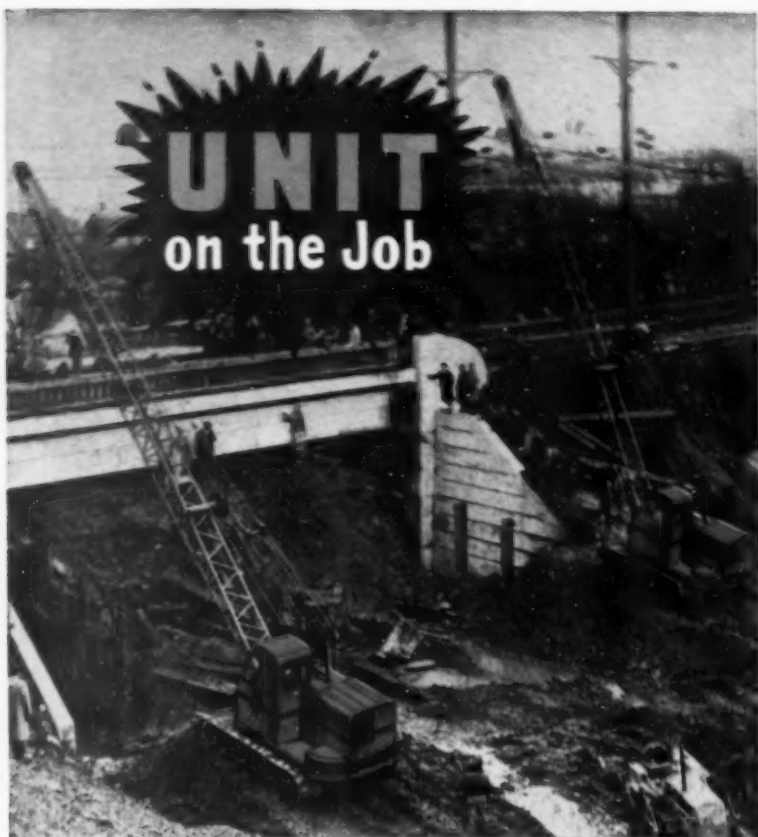
which determines the exact amount of power required each instant and automatically matches engine speed to load requirements. This increases work capacity, adds to equipment life, saves fuel and engine wear.

Cummins Diesels, ranging from 60 to 600 h.p., equipped with one of many types of torque converters, can match any job you have. Available as replacement units or in many makes of new equipment.

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Rugged diesel power (60-600 h.p.)



## TEAMWORK and Accurate Control

Working as a team, these two UNIT 1020 Cranes moved a 500 TON railroad bridge from its temporary mounting to the new structure in a period of thirteen (13) minutes. This type of job calls for smooth and accurate control of boom and hoist line operation. UNIT'S extra long crawlers, multiple-hinged shoes, wide axles, and hook rollers provide perfect balance and stability. This, together with the FULL VISION CAB for complete visibility, makes UNIT the machine that is dependable and safe to handle efficiently any type of heavy-duty work.

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(Continued from page 40)  
required on, without liability upon either party, terminate the contract."

An action was brought by the contractor against the city for a decree that this construction contract was void and unenforceable by reason of this clause. The California appellate court holding the validity of the contract unaffected by this provision, said:

"The clause here under consideration, defining the rights of the parties if the Federal Government should stop the work, would seem to be similar to clauses in contracts existing performance because of natural calamities. These covenants, sometimes called acts of God, are familiar in the law of contracts.

"Force majeure" is not necessarily limited to the equivalent of an act of God. The test is whether under the particular circumstances there was such an insuperable interference occurring without the parties' intervention as could not have been prevented by the exercise of prudence, diligence and care.

"It was entirely proper for the governing body of the City of Long Beach to provide what would be done in the event the Federal Government should stop the work. Instead of impinging upon, this clause recognized and protected the substantial rights of the city, the property owners affected and the contractor."

\* \* \*

*Mathes v. City of Long Beach, 263 Pac. 2d 472, Cal., Nov. 24, 1953.*

## Chicago-Florida expressway persists in the news

What started out to be a Governor's political pipe dream has become a more tangible project, following additional meetings between highway officials involved. The proposed \$1.5 billion North-South Expressway between Chicago and Florida now has a financial adviser, Smith, Barney & Company, of Chicago. Three meetings of interested officials have taken place recently, and William F. Corlin, Commissioner of Highways of Kentucky, has been made permanent chairman of the North-South Expressway Committee.

The expressway project between Louisville and Elizabeth, Kentucky, would be a link in this road, as would Florida's 110-mile Sunshine Parkway, extending from Hollywood to Fort Pierce.

Marlow Appoints District Engineer  
William E. Galland has been appointed district engineer by Marlow Pumps, Ridgeland, S. I., for northern California, with headquarters in the Sacramento area.

# "ADAMS Creeper Gears"

permit work not possible  
with other graders" — says  
Taylor Construction Company



● "The heavy construction of the machine and the wide range of speeds, make our Adams Motor Grader adaptable to many varied conditions. On a heavy rock job in Tennessee (pictured), the low creeper gears allowed us to work under conditions other graders could not match." Thus reports Baxter Taylor, Taylor Construction Company, Asheville, N. C.

Adams Improved Motor Graders have many operating advantages which contribute to their greater work capacity — such as 8 Regular Forward Speeds, With High Transport Speed; 4 Reverse Speeds; Dual Braking System; Foot Accelerator.

For a new experience in motor grader performance, ask your local Adams dealer for a working demonstration. Convince yourself that Adams Motor Graders are to-day's best buy.

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## \* ADAMS Creeper Gears (Optional)

Provide speeds from 1/4 to 1 3/4 mph.

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Permit gearing grader to extra-low-speed work—as in working in rocky soil—without sacrificing power. Operator is not tempted to slip clutch—tire slippage is practically eliminated—shock loads are materially reduced . . . Also advantageous on fine finishing work.



Motor Graders



Travelers



Pull-Type Graders



# DIGEST of Current Technical Literature

By JOHN C. BLACK, Associate Editor

## Grassed road shoulders and airport surfaces

Bearing qualities and durability of turfed or sodded, highway shoulders and airfield surfaces, including landing strips, depend on right grass and right soil. Most soils can be improved in both stability and grass-growing qualities by the addition of suitable materials from outside sources.

Studies begun in 1944 as a cooperative project of the Soil Science Department of Michigan State College and the Research Division of Michigan State Highway Department are reported in detail. Reference is made to data and descriptions in a progress report dated 1947.

"The most desirable grasses for these purposes should have the following characteristics: (1) adaptation to local soil and climatic conditions; (2) resistance to load penetration and traffic abuse; (3) rapid recovery following intensive use; (4) drought resistance; and (5) low maintenance cost. Relatively few known grasses commercially available possess all of these characteristics."

"The results of the test sections indicated that Chewings fescue was an excellent grass to plant on shoulder surfaces stabilized with sandy or gravelly materials. Those plots on which quackgrass predominated showed very good results on load-bearing capacity. This can be attributed mainly to the widespread root-basket and heavy top growth which flourished on all soil types involved in the test. Top-soils consisting of Miami loam, Brookston loam and Bellefontaine sandy loam can be satisfactorily mixed with sands and gravels to produce a turf, while mixing clay and peat had varying results. Chewings fescue was best suited when planted with small amounts of nurse grass to aid in starting and protecting the slower growing fescue. An excess of the so-called nurse grass was detrimental to the establishment of a cover of Chewings fescue since the nurse grass flourished the first year following quick germination and died out, leaving a sparse cover of fescue the second and subsequent years. Fertilizing and reseeding were required to maintain a good stand."

In spite of favorable test showings, quackgrass, being classed as a noxious weed, is ruled out from road shoulder and airport use.

"In general, a satisfactory turf coverage to meet current requirements for highway shoulders was present throughout the test period on all plots having Miami and Bellefontaine additives, on incoherent sand and processed 22-A graded gravel with Brookston and clay, and peat additive soil materials. The plots with Brookston and clay and peat additive materials on pit-run gravel and graded sand were, in general, below the accepted standards of from 65 to 70 per cent coverage."

"Kentucky bluegrass did not survive under the conditions of the experiment on any of the turf plots."

"Investigations of root penetration depths were found to be about 5 in. This would indicate that, on the average, the roots were contained in the zone of the profile containing the additive soil materials and not down into the base course layers."

Plate bearing, penetrometer, and rutting tests were conducted on 48 plots. A formula for modulus of sub-grade stiffness in plate bearing tests was developed.

The report, with numerous tables and diagrams, occupies 21 pages.

*"The Influence of Soil Mixtures on Turf Growth and Soil Stability for Highway Shoulders and Airports"* by G. C. Blomquist, Civil Engineering Department, Michigan State College, Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. (Publication 268, "Roadside Development," 1953, Price \$1.35).

## Tests on fatigue in timbers

In the spring of 1949 the Association of American Railroads, under the sponsorship of Committee 7—Wood Bridges and Trestles, of the American Railway Engineering Association, initiated a research program to obtain information relative to the fatigue life and behavior of timber of sizes commonly used in railroad bridges and trestles. The laboratory investigation was divided into two parts: (1) Fatigue bending tests on full-size timber stringers and standard block shear tests on small clear specimens

at the Purdue University Engineering Experiment Station; and (2) Static bending tests on small scale specimens at the U. S. Forest Products Laboratory, Madison, Wis. The progress report, a single excerpt from which appears below, occupies 51 pages in the AREA bulletin.

Timbers tested were green southern pine and Douglas fir.

"Fatigue bending tests were conducted on 2-in. by 2-in. by 32-in. specimens which were subjected to center loading on a 28-in. simple beam span. The results of these tests are presented in a table and diagrams. From these tests the following observations are made:

"1. The tests of the green southern pine and Douglas fir were too few in number to locate the S-N curves.

"2. The tests were sufficient to indicate that if the maximum repeated stresses in bending are 50 per cent or less of the static modulus of rupture, the fatigue life is at least 30 million repetitions of stress, provided that the wood is straight grained and free from defects and that conditions of loading are no more severe than a stress ratio of 0.10. It was not possible from the limited number of tests included in this study to predict the fatigue strength of green southern pine and Douglas fir for 2 million cycles. Eleven of the 15 tests with a maximum repeated stress of 60 per cent of the modulus of rupture of matched control specimens exceeded 2 million cycles.

"3. Fatigue in bending the green specimens always started with a compression failure near the loaded surface. The compression failures became progressively worse as the tests progressed and were followed by either a sudden tension failure or by a shear failure that originated near the bottom of the compression failure. The shear failures were not generally visible, but after they occurred it was not possible to maintain maximum repeated stresses in the specimen."

Fatigue life is defined as "the number of stress cycles which can be sustained for a given test condition";

Fatigue strength as "the greatest stress which can be sustained for a given number of stress cycles without fracture";



S-N diagram as "a plot of stress against number of cycles to failure."

*"Investigation of Fatigue Strength of Railroad Timber Bridge Stringers," A progress report covering initial work done in fatigue testing of full-size timber bridge stringers and other exploratory and correlated tests, by J. L. Leggett, Jr., Associate Professor of Civil Engineering, University of Kentucky, AMERICAN RAILWAY ENGINEERING ASSOCIATION BULLETIN, 59 E. Van Buren St., Chicago 5, Ill., September-October, 1953.*

### California cement base stabilization methods

*By Earl Withycombe. Proceedings, Fifth California Street and Highway Conference, pp. 34-38, Feb. 4-6, 1953. Highway Research Abstracts, February, 1954.*

Cement treatment of bases and subgrades, first tried in California in 1921, has become so commonplace that more than 4½ million sq. yd. of material received some form of cement treatment on state roads in California in 1952, accounting for 230,734 barrels of cement.

Cement treatment is used in three ways: (1) cement-treated base, a foundation of limited slab strength greater than that of natural material but less than that of concrete; (2) cement-treated subgrades, to make subgrades for concrete pavements resistant to displacement and erosion; and (3) low-cement-content treatment, to overcome susceptibility of foundations to volume change and increase their shearing resistance.

Early practices in constructing cement-treated base specified high cement content sometimes yielding 28-day strengths of 2,000 to 3,000 psi. It has been found that strength of 650 psi. at 7 days was a point where cracking was not objectionable. Cement contents range from 4 to 7 per cent. Mixing is now mechanical and production as high as 250 tons per hour is not uncommon. Twelve-ton, three-wheel rollers are used for initial rolling and pneumatic-tire rollers for finish rolling. Curing is with 0.2 gal. per sq. yd. of asphaltic emulsion. Cement-treated subgrades for concrete pavements are constructed to 4 in. after side forms for the pavement have been set. Designs for cement-treated subgrade aim at 300-psi. strength in 7 days and require 3 to 5 per cent cement.

Low-cement-content treatment aims to improve soils with limited plastic qualities to make them the equivalent

of rock bases for pavement foundation. Cement contents range from 1 to 2½ per cent. This type of treatment has averaged 15 cents per sq. yd. for mixing and \$4.30 per barrel of cement, or about \$4,000 per mi. of 6-in. depth and 26-ft. width.

### Effects of jet exhaust on airport pavements

"Operation of jet aircraft has raised many questions concerning the performance of airport pavements subjected to fuel spillage and high exhaust temperatures. It is believed that spillage is not a serious problem. However, the effect of the jet blast is significant. Observations made on fields where jet aircraft operations are of a sufficient magnitude so as to furnish performance data disclose that the areas seriously affected are small in extent and are confined to locations where sustained run-up periods occur, thus subjecting the pavement to sustained blasts. No damage has been observed so long as the jet aircraft is in motion.

"The end of the blast on the pavement will depend on the design of the aircraft with respect to the velocity of the blast and the angle of the exhaust. As the direction of blast approaches the horizontal, the less important the blast becomes, so far as pavements are concerned. Because of this, observations of transport types of jet aircraft indicate that there is no detrimental effect on the airport pavement."

*Excerpt from "Recent Airport Design and Development" by Philip A. Hahn, Chief Airport Eng. Div., Office of Airports, Civ. Aeronautics Administration, U. S. Dept. of Commerce, Washington, D. C., PROCEEDINGS, AMERICAN SOCIETY OF CIVIL ENGINEERS, 33 W. 39th St., New York 18, N. Y., June, 1953—Vol. 79, Separate No. 196, price 50c.*

### Why and how of steam cleaning

"Time studies claim mechanics devote only 60% of their working time to actual repair, the other 40% is spent wiping grease and dirt off parts. Steam cleaning eliminates wiping grease off by hand."

The paper of which the foregoing is an item is properly headed, "Why and How."

Some of the "whys"—those concerned not with method but with benefits to be gained regardless of "how"—are easily under-valued.

"One of the big reasons for steam

cleaning and repainting is better use by operators of new-looking equipment. Here is a typical example:

"A deputy county road commissioner reports that in one of his districts where older dump-trucks were being used, a front-end loader continually hit and damaged the trucks. The trucks were cleaned and painted, and there was no more trouble. Every hit inevitably stood out on the new paint job!"

Another angle, of course, is that of the equipment dealer, who knows well enough how cleaning and painting help sales.

Regarding time required, the author says:

"Cleaning time naturally varies with dirtiness of the equipment, but for thorough cleaning prior to painting, shop estimates place average time as follows:

small tractor.....	45 to 60 minutes
medium tractor.....	1 hour
large tractor.....	1½ to 2 hours
motor graders.....	3½ hours
clamshell buckets.....	30 minutes
tractors with front-end loaders.....	2½ hours

*From "Why and How of Steam Cleaning," by Michael H. Dugener, THE EXCAVATING ENGINEER, South Milwaukee, Wisc., September, 1953.*

### M.I.T. to hold summer soils engineering class

A special summer program in Soil Technology will be given from Tuesday, June 15, through Friday, June 25, during the 1954 Summer Session at the Massachusetts Institute of Technology, Cambridge.

The program is offered, says Professor Ernest H. Huntress, director of the M.I.T. Summer Session, to meet the widespread interest in this rapidly advancing field.

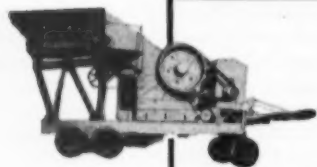
The 1954 program will be under the direction of Dr. T. William Lambe, associate professor of soil mechanics, who is director of the M.I.T. Soil Stabilization Laboratory. He will be assisted by several guest lecturers as well as by other members of the M.I.T. faculty and staff.

The program is especially planned for engineers working with soil; applicants should have a Bachelor's degree in engineering or equivalent experience. Tuition is \$160; academic credit is not offered. For information and application blanks address the Summer Session Office, Room 7-103, M.I.T., Cambridge 39, Mass.

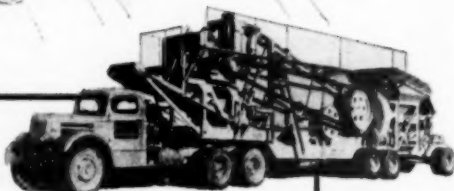
● Brig. Gen. William W. Wanamaker, executive director of the New Jersey Turnpike Authority from 1949 to 1951, has been reappointed to that post.



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GREAT NAMES  
NOW BEHIND  
DIAMOND EQUIPMENT  
and SERVICES**



To the scores of satisfied users of Diamond products, and to future Diamond customers, it is a pleasure to announce that the Diamond Iron Works line of crushing, screening, washing, and conveying equipment for rock, gravel, aggregate, and corporate aggregates has been acquired by Goodman Manufacturing Company, Chicago.



Goodman, 54 years a leading designer and manufacturer of heavy equipment for underground mining and tunnelling, will contribute advantages inherent in a large organization of sound reputation and technical skill.

Manufacturing, as well as Diamond's sales and engineering departments, have been transferred from Minneapolis to the Goodman plant in Chicago. Now that larger and better facilities are available, Diamond users can expect such benefits as improved service—better-than-ever Diamond products.

Experienced engineering and sales counsel will be maintained by Diamond veterans. An established Diamond distributor—there are more than fifty located throughout the country—will continue to serve you. Your call upon any of our services will be promptly cared for.



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division GOODMAN MANUFACTURING COMPANY

Halsted Street and 48th Place • Chicago 9, Illinois

# Wins Race With Time And Death

An Actual Job Report from



## New Highway Ends Traffic Danger at Atomic Plant

PORTSMOUTH, OHIO: —safely carry the increased traffic of the 40,000 new families here today expected when the new Atomic Energy Plant is completed near here. Highway officials here today hailed Bill Ward and his crew of Construction Service, Inc., who completed a difficult sub-contract, part of the relocation of U. S. Highway 23, in one-third the expected time. Ward's contract covered cutting more than 312,000 cubic yards of earth and rock off steep Four Mile Hill and filling fast work speeded completion of the new four-lane express-way replacing an old narrow, twisting road which could not

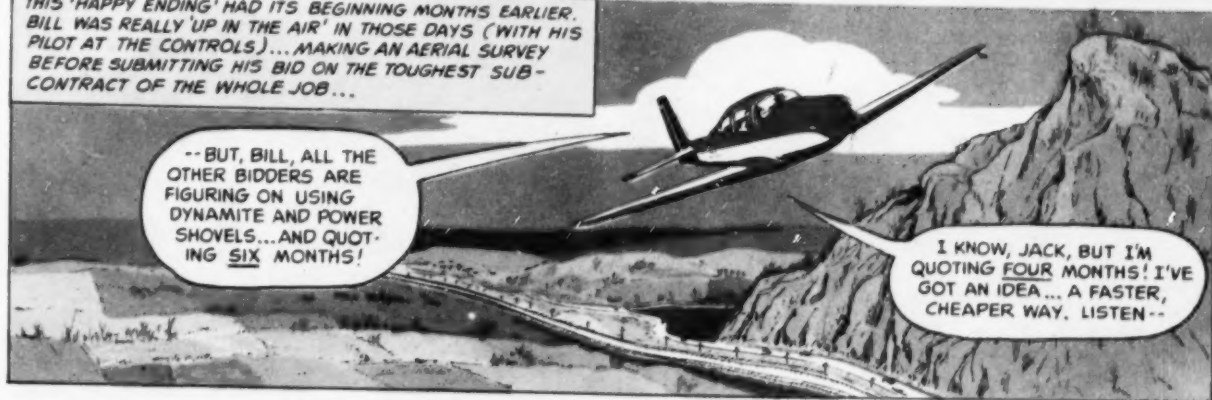
WELL, THERE SHE GOES, BILL... THE LAST LOAD OF 'THE JOB THAT COULDN'T BE DONE!' AND TWO MONTHS AHEAD OF SCHEDULE, THANKS TO THAT IDEA OF YOURS!



THIS 'HAPPY ENDING' HAD ITS BEGINNING MONTHS EARLIER. BILL WAS REALLY 'UP IN THE AIR' IN THOSE DAYS (WITH HIS PILOT AT THE CONTROLS)... MAKING AN AERIAL SURVEY BEFORE SUBMITTING HIS BID ON THE TOUGHEST SUB-CONTRACT OF THE WHOLE JOB...

-- BUT, BILL, ALL THE OTHER BIDDERS ARE FIGURING ON USING DYNAMITE AND POWER SHOVELS... AND QUOTING SIX MONTHS!

I KNOW, JACK, BUT I'M QUOTING FOUR MONTHS! I'VE GOT AN IDEA... A FASTER, CHEAPER WAY, LISTEN--





WARD GETS THE TOUGH JOB, AND, SOON, AT THE ROCKY, RUGGED 520-FOOT PEAK--

HOW DO YOU PLAN TO HANDLE ROCK THIS BIG WITHOUT BLASTING? ONLY A MOUNTAIN-GOAT COULD GET AROUND UP HERE!

--OR A GOOD CRAWLER. LOOK -- I'M COUNTING ON INTERNATIONAL TD-24S TO LICK THIS PART OF THE JOB.



SEE -- THAT CRAWLER IS CHEWING OUT ROCK AS BIG AS ITSELF!

INSIDE A WEEK, HANGING ONTO THE STEEP SLOPE, THE BIG TD-24 CRAWLERS CUT DOWN TO THE 400-FOOT LEVEL, MAINTAINING  $1\frac{1}{2}$  TO 1 GRADE. THEN THEY HACK OUT A BENCH SO THAT THE INTERNATIONAL SCRAPERS CAN BE BROUGHT IN.

THERE'S YOUR IDEA AT WORK, BOSS -- PUSHLOADING AT 400 FEET WITH TD-24S AND SCRAPERS.

THOSE BIG RIGS CAN SURE TAKE PUNISHMENT!



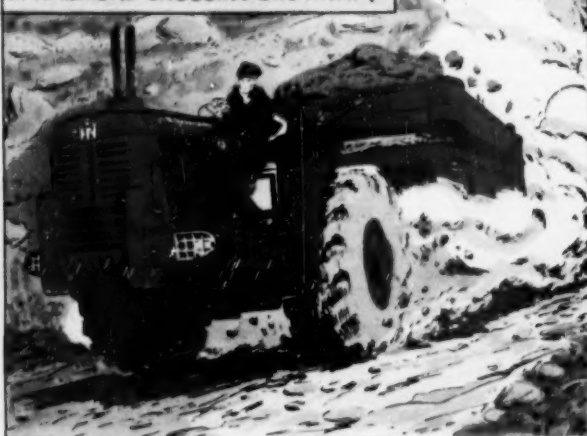
AT 300 FEET, THE GRADE LESSENS. PHASE 3 BEGINS. NOW, INTERNATIONAL TWO-WHEELED, RUBBER-TIRED TRACTORS AND SCRAPERS TAKE OVER, AND THE CUTTING AND CARRYING REALLY SPEEDS UP...

WE'RE REALLY ROLLING, BOSS... AND THOSE INTERNATIONALS ARE GAINING A LOAD AN HOUR ON OUR OTHER RIGS!

GREAT, ED. IT LOOKS AS THOUGH WE'RE IN -- BUT KEEP PUSHING!



IT'S A MILE HAUL FROM THE CUT TO THE FILL FOR THE OVERPASS -- DOWN-HILL LOADED AND UPHILL BACK--AND A RAILROAD CROSSING EACH WAY!



UNEXPECTEDLY, TRAFFIC ON THE RAILROAD DOUBLES...  
JUST AS THE FAST INTERNATIONAL RUBBER-TIRED RIGS  
START THE OVERPASS-FILL ON THE OTHER SIDE OF THE TRACKS!



LOOK AT THAT... THE 18<sup>TH</sup>  
LONG COAL TRAIN TODAY! AND,  
YESTERDAY, THEY COST  
US 2½ HOURS--

I DIDN'T FIGURE  
THIS IN MY BID. BUT  
THOSE INTERNATIONALS  
HAVE PUT US  
WAY AHEAD.



C'MON,  
C'MON...  
LET'S GO!

WE'RE THE ONLY  
OUTFIT WORKING  
TODAY. RAIN CAN'T  
STOP THIS CREW!



ONE MIDNIGHT, AS THE JOB GOES  
INTO THE 'HOME-STRETCH'...

GOT TROUBLE,  
SHORTY?

NO TROUBLE, BOSS, JUST  
REGULAR GREASIN'. STILL  
NO DOWNTIME ON THIS JOB!

AND THEN THE WARD OUTFIT SETS ANOTHER RECORD, IN SPITE OF THE TRAINS... 8,400 CUBIC YARDS MOVED  
IN 9 HOURS ON AN 8,000-FOOT CYCLE, USING 7 HAUL UNITS! TWO MONTHS FROM THE STARTING DATE,  
THE JOB IS FINISHED, AND...



HALF THE FIGURED TIME,  
MR. WARD! ON THIS JOB,  
WHEN YOU SAVED DAYS,  
YOU SAVED LIVES, TOO!

IT WAS PART LUCK, ALL  
RIGHT... BUT I GIVE THAT  
CREW OF MINE GOOD  
EQUIPMENT, AND THEY  
MAKE THEIR OWN BREAKS!

# Head in the clouds, feet on the ground

**B**ILL WARD, owner of the Construction Service, Inc., Ludlow, Kentucky, is a man with his head in the clouds... but only when he's making an aerial survey of a prospective job in his four-place Navion plane. The rest of the time his feet are very firmly planted on the ground, when it comes to getting things done in the contracting business.

Starting as a shovel runner in New England for B. Perini & Sons, Inc., Framingham, Mass., Bill worked up to superintendent. In 1945 he realized an 18 year ambition by going into business for himself with a single power shovel. On the Four Mile Hill subcontract he used 20 big pieces of earth-moving equipment, including six INTERNATIONAL crawlers with matched INTERNATIONAL dozers, two INTERNATIONAL B-170 scrapers, and three INTERNATIONAL two-wheeled, rubber-tired tractors and scrapers.

He's proudest of the fact that he won the 1952 Safety Award given by the West Virginia chapter of the A.G.C. Association in the 10-20,000 man hours per year class for not having a single lost time accident. In 1953 he again finished out the year with a similar safety record. That's a real tribute to Ward, his men, and his big red INTERNATIONAL Power!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS



INTERNATIONAL

POWER THAT PAYS

## Now All in One Family

*The hardest-working work teams in the world!*



TD-24 crawler with matched scrapers



TD-18A crawler with matched scrapers



TD-24 crawler with bulldozer



T-9 and TD-9 crawler with hydraulic bulldozer



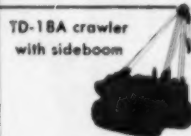
T-6 and TD-6 crawler with hydraulic bulldozer



TD-14A crawler with cable bulldozer



TD-9 tractor with front-end loader



TD-18A crawler with sideboom



Model 2T-75 two-wheel, rubber-tired tractor with 18 heaped-yard capacity scraper



Model 2T-75 two-wheel, rubber-tired tractor with 20 heaped-yard capacity bottom dump wagon

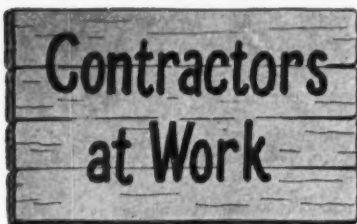


Model 2T-55 two-wheel, rubber-tired tractor with 13 heaped-yard capacity scraper





● Load calibrating station, first double-check in getting an accurate spread of base materials for Florida airfield.



### 8 Pages of Useful Job Methods

*See also how contractor ferried big trusses 75 miles up-river. . . . How a million yards of dirt was moved through Chicago streets. . . . Other items. . . . Send us snapshots of your job.*

## Load Check Station Helps Get More Accurate Spread

**I**N spreading imported lime rock base material for a runway job at Pinecastle Air Force Base, Florida, the W. L. Cobb Construction Company used the load checking station pictured. Its purpose: to help get an accurate tonnage of material windrowed per lineal foot of airstrip. Since payment was on a square yard basis, this check helped the contractor meet thickness specifications yet use the least excess material for which payment wouldn't be allowed.

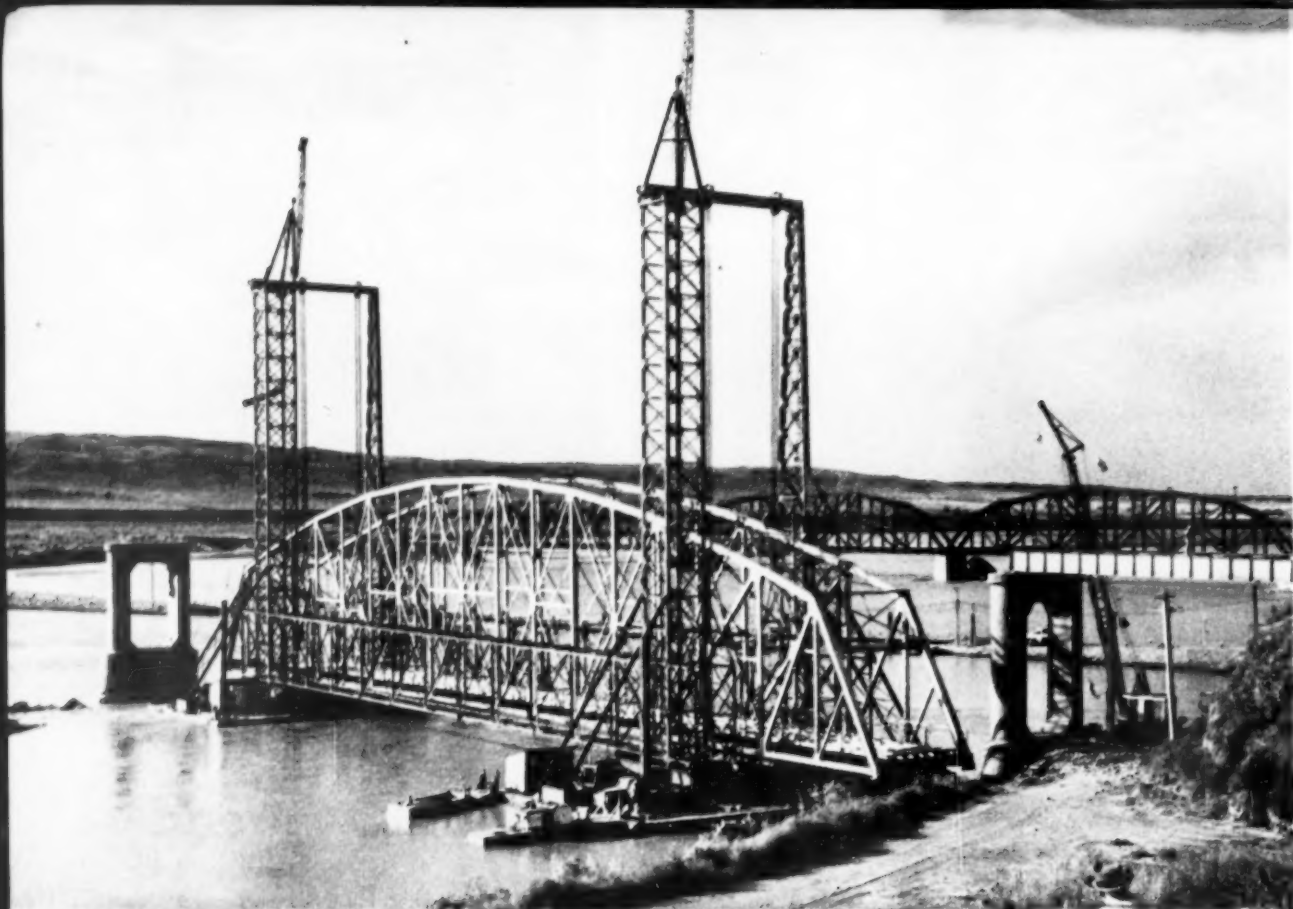
The station consisted of two platforms with just enough space between for a truck to drive through. On the inner side of each platform a wooden railing was built to the height of a

heaped calibrated load. The two checkers, stationed on the platforms, checked the load quickly by simply lifting the plank down from atop the posts (where it is seen in the picture) and laying it across the railings. With a little experience these men learned how many shovels of material to throw off (or perhaps add) to trim the load to standard yardage.

The load was then dumped in the runway windrow, at a position spotted by the foreman using a cloth tape. Material was laid out with a motor grader and blended with the sand of the site to form an accurately controlled specification mixture ready for blading and rolling.

● Load dumping positions spotted carefully by grade foreman with tape measure. Pulverizing mixer then makes passes to blend imported lime rock with local sands for specification base layer.





● Transporting a 336-ft. truss from abandoned site at Chamberlain, span having just been lowered 35 ft. from old piers for 1,000 ft. trip downstream. (Corps of Engineers Photo.)

## Heavy Trusses Floated and Hoisted to

*Novel methods used to transport and raise 250-ft. and 336-ft. trusses, for highway bridge at Chamberlain, South Dakota. Two bridges from abandoned sites above dam were salvaged at considerable cost saving.*

**By K. R. Scurr**

Bridge Engineer, South Dakota State Highway Commission, Pierre

THE ceremony of March 8, in which President Eisenhower pressed a button and started the first turbine at Fort Randall Dam, in South Dakota, spotlighted one of the nation's new major river impounding projects. A hundred miles upstream a related project was quietly functioning which, although little publicized, also represented quite an

achievement of the engineer and construction man. I refer to the new arterial highway bridge over the Missouri river at Chamberlain, S. Dakota, necessitated by the creation of the Fort Randall Reservoir pool.

The new bridge, consisting of a dual line of trusses and girders 2,004 ft. long, was assembled from two existing bridges. One was the Wheeler

bridge downstream, abandoned due to the pool rise; the other was the single-roadway bridge at Chamberlain, which had to be raised for navigation clearance. Following are a few highlights of the design and construction details:

The dual structure, from west to east, consists of one 64-ft. approach span; one continuous girder unit, 92'-116'-92'; three paired through trusses, each 256 ft. (total 6 trusses); two paired 336-ft. spans (total 4 spans); and two girder spans, 92-ft. Median strips separate the dual roadways on the approach spans entering the separated paired trusses.

Because of the special interest in the superstructure methods, these will be described first. The superstructure contract was awarded Sept. 30, 1952,



● (Left): Another view of a 336-ft. span on the floats. (Right): Span being raised 54 ft. in cradle for setting at new site. (Corps of Engineers photos.)

## Form New Dual Bridge over Reservoir

to Guy H. James Company of Oklahoma City, Okla., the Foster-Smetana Company, of Omaha, Nebr. Principal new material consisted of 1,772 cu. yd. of class A concrete, 884,000 lb. of structural steel and 377,000 lb. of reinforcing steel. Chief item of work consisted of the salvage and re-erection of six 250-ft., 175-ton truss spans from the Wheeler crossing, 75 water miles downstream, and of four 336-ft., 285-ton truss spans from the Chamberlain crossing 1,000 ft. upstream from the new site.

### Truss Salvage Methods

The salvage and transport of these trusses was sublet to the John F. Beasley Company of Chicago and Muscogee, Okla. The specifications permitted the removal and re-erection

of the trusses either in sections or intact. This firm chose to move them intact with floating equipment, since dismantling the spans would have required costly falsework and 85,000 rivets for re-erection.

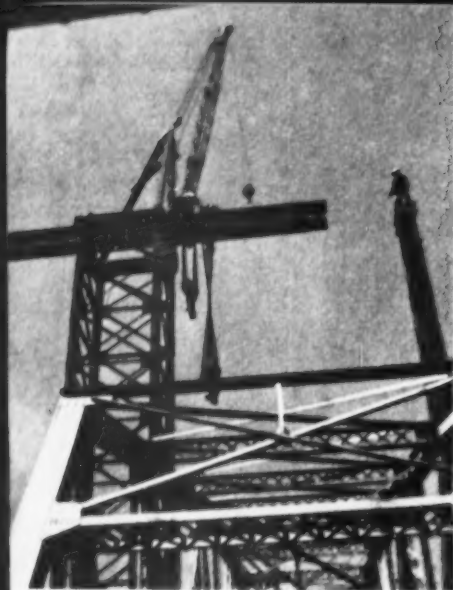
The equipment consisted of two barges 80 by 100 ft., each formed from 8 x 16 ft. steel pontoon cells. The barges were joined by two structural steel trusses approximately 24 ft. deep, so placed that the bridge trusses would be supported at panel points L-2 on the barges and between the joining trusses.

A bolt-connected lifting tower, 110 ft. high, was constructed on each barge. Directly opposite on each barge, a tower of similar construction was carried to approximately 60 ft. in height and there tapered to a

double truss construction, to a total height of 110 ft. A lifting beam carrying two 7-sheave pulley blocks for 1½ in. high-strength cables joined each pair of towers at the top. The rig was operated by a 4-drum American hoist, powered by a 300-h.p. diesel motor with torque converter.

This equipment handled the spans easily and movement over water started on May 22, 1953, using four sea mules for power, placed as pushers. Movement within the pool was smooth and rapid. However, when the load entered the flowing stream, about 18 miles above the loading point, there was not adequate water to permit efficient operation of the sea mules. Various combinations of power units were tried but no satisfactory progress was made until four





● Derrick dismantling lifting arm and post.



● Earthwork ramp and sand islands used in pier foundation construction.



● H piles for pier foundation driven in sand island.

small river tugs were procured and the first span was finally delivered to the site on July 2.

A small stiff leg derrick was used to raise the transmission lines to permit access to the piers, and the final placement was made on July 7. The derrick on top of the main lifting tower was then used to lower the hinged secondary lifting tower from the far side of the span, permitting the barge to release from its load and return for a second span.

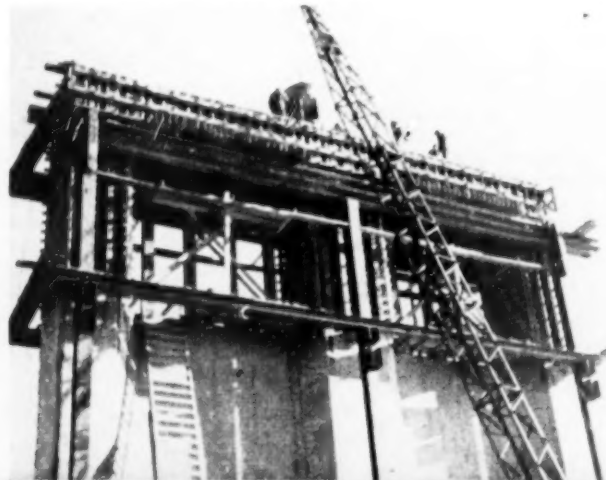
With proper power, the second span was moved the 75 miles and placed in 14 days, and moving time for each succeeding span until the sixth and last span was reduced to 7 days.

The rig was then converted to receive the four 336-ft. Chamberlain trusses and their movement over 1,000 ft. distance completed in 12 elapsed days, utilized the same methods.

In order to expedite completion of

● The completed bridge—showing how old trusses were paired and linked with 4 lane approach spans. (Photos by Minneapolis Star and Tribune Co.)

● Insulated forms used in winter pier work.



the structure and to avoid pouring the concrete floor under conditions requiring heat, the contractor requested and was permitted to use "Corru-form" as a bottom form in lieu of conventional wood panels. The costs of leaving this material in place was considered to be offset by the more rapid progress and the fact that hazardous under-floor form removal work at high levels was eliminated. The south roadway was opened to traffic Oct. 31; the entire bridge Dec. 7, 1953.

The substructure contract was let in May, 1952, to Guy H. James Construction Company of Oklahoma City and Condon Cunningham Company of Omaha. Principal quantities included 8,300 cu. yd. of class A concrete, 860,540 lb. of reinforcing steel, and approx. 19,000 lin. ft. of steel H bearing piles (largely 14-in. H-BP 102 lb., furnished by the state to expedite delivery).

The contractor used island construction to narrow the river to about 300 ft. in the final stage of pier work (see photo), by placing a heavy fill of chalk (soft limestone) and shale procured about  $\frac{3}{4}$  mile away.

Work went on in winter despite below-normal temperatures, sometimes sub-zero. Insulated forms were used without heat. The pattern of curing, even in coldest weather, was noteworthy in that concrete made with heated aggregates was placed at about 70 deg. F, attained a maximum of 95 to 104 deg. temperature in about four days, and subsequently lost temperature at four degrees per day.

Form insulated consisted of a double layer of Balsam Wool blanket placed between and over studding.

Steel H-piles were driven under open conditions using a Vulcan hammer with 15,000 lb. energy at head, handled by a Lima 2½-yd. crane with air from a 600 cfm, compressor. Concrete was produced in a 2-yd. mixer supplied from a fully automatic batch plant located at a rail siding two miles from the site. Concrete of 4,000 psi. or better was produced.

It is noteworthy that a practically perfect fit was obtained for the swedged anchor bolts, set in the piers to receive the shoes of the salvaged trusses. Minor drifting of a fraction of an inch was necessary in two cases.

The bridge was designed, let and supervised by the South Dakota State Highway Commission under a cost reimbursable (less betterment) contract with the U. S. Corps of Engineers, Omaha District. Robert E. Leech was project manager of the contractors for both substructure and superstructure; George Green project superintendent on the superstructure. U. R. Molseed was resident engineer and L. S. Hilligoss inspector for the state.



● Final trim of inner slopes of reservoir accomplished by a suspended motor grader.

## Grader Trims Steep Slope

**A** MOTOR grader suspended from a tractor, as shown in the accompanying picture, put on quite a show recently on a job at Tucson, Arizona.

The project was for a city water supply reservoir for the city of Tucson; Yost & Gardiner of Phoenix, engineers, and San Xavier Rock and Sand Co., of Tucson, contractor.

The reservoir was designed as a circular structure of 20 million gallons capacity. The principal work consisted of excavating sufficient material from the circular site to form a dam around the periphery.

Main excavation was accomplished with a heavy tractor with dozer and two tractor-drawn scrapers. The native soil used (a sandy clay loam) was deposited and compacted to the specified 90 per cent density at optimum moisture content, using tandem

sheepsfoot rollers for the 6 in. compacted lifts. The top was built about 6 in. above grade, in order to provide for final trimming and shaping to close tolerances.

The inside was trimmed to a slope of 2 to 1 as shown in the photograph. The outside was trimmed to 2½ to 1 slope with a bulldozer working circumferentially around the top, then working up and down the slope from the bottom.

The excavation averaged 11 ft. and the final depth of the reservoir to top of berm was 23½ ft.

The inside slope and bottom were paved with a 2½-in. layer of gunite, reinforced with No. 8 wire mesh electrically welded on 4 in. centers. The project cost \$282,151. Lane E. Day was job superintendent for the contractor.

● Grading nearing completion for circular reservoir.





## Hauling 1,000,000

*Dirt and rubble from other expressway projects transported an average of 8 miles, at contract prices ranging from \$1.10 to \$1.58 per cubic yard, including excavation and dumping, at a saving over proposed hydraulic filling.*

*First of a series of reports on construction and excavation hauling — methods, equipment and costs.*

● Loads were heaped with care to avoid spillage of slippery wet clay.

### Roads and Streets Special Field Report

**T**RANSPORTING 1,300,000 cu. yd. of fill material for the Foster Drive Extension of Lincoln Park through 8 miles of the traffic-studded streets of Chicago has been accomplished by the use of a vast array of carefully scheduled hauling equipment. Approximately 300,000 cu. yd. more of fill will be required to complete the project.

The fill area needed for a northward extension to Lake Shore Drive comprises a 70-acre section extending  $\frac{3}{4}$ -mile along Chicago's lake front north from Foster Ave., 44 acres of the fill being over water. To alleviate the serious traffic bottleneck caused by north-bound traffic emptying west into Foster Ave., two 48-ft.-

wide roadways were constructed over the fill to carry a portion of the traffic to Bryn Mawr Ave.,  $\frac{1}{2}$  mile to the north. Eventually, the balance of the area will be seeded for recreational purposes.

Jurisdiction over the project is shared by four agencies, with the Chicago Park District being in charge of the fill work; Cook County, the paving; the City of Chicago, bridge construction; and the State of Illinois, the administrative work.

At the start of the project in 1950, Park District engineers considered sand, pumped from the lake bottom, as fill material. However, a bid of \$1.39 a cu. yd. for the sand was rejected when officials realized that

greater economies could be effected by using spoil from the Congress Expressway and other construction areas in the city.

Contracts were let to three contractors—W. J. Sheppard & Co., Palumbo Excavating Co., and Krug Excavating Co.—for hauling 666,000 yds. of spoil from the Congress Expressway excavation at unit prices ranging from \$1.10 to \$1.58 a cu. yd., the unit prices to include excavating, hauling and dumping. Another 200,000 cu. yd. was moved from the Grant Park Garage excavation by the Speedway Wrecking Co. In addition, a number of smaller contractors, working under special permits, were allowed to dump their waste at the Foster Ave. site.

Aside from the bids submitted for disposing of Congress Expressway waste at Foster Ave., the contractors presented alternate bids for dumping in other areas. Unit prices for these areas averaged 30 cents a yard over the Foster Ave. prices. That disposing of the Congress waste at Foster Ave. was a substantial economy can readily be seen when comparisons are made with the cost of the hydraulic sand fill, had it been used. In addition to the \$1.39 per cu. yd. cost for the sand, the city would have been compelled to pay an average of at least \$1.64 per cu. yd. to move the spoil



● Large semi's as well as 14-yd. dump trucks were used, the trailers representing an innovation in Chicago-area earth hauling.



# Yards of Fill Through Chicago's Streets

from Congress to remote waste areas.

Hauling equipment used by the four larger contractors included 31 Macks, 24 Whites, 16 Autocars, 19 Internationals and 10 Sterlings. Capacities for the trucks averaged 14 cu. yd. each except for those which drew trailer bodies; these were rated at 20 yd. each and included 7 Talberts, 5 Anthonys, 5 Fruehaufs and two Tees. The peak number of loads dumped in a single day was 600. The haul routes were charted through wide business-area streets such as Western Ave. and Halsted St., depending on the section of the Congress excavation being worked on. The round trip, which averaged 16 miles in length, took about one hour.

Excavated material accepted for the fill consisted of over-burden down to minus 3 ft., city datum. This consisted of rubble such as broken concrete and building stone, yellow clay and granular material. None of the Chicago blue clay, which is plastic in nature, was accepted.

## Water-Side Fill Methods

The first step in the fill operation was to lay down a network of truck-compacted haul roads at the Foster Ave. site for easy access to the fill areas. Then, as the loaded truck reached the site, the material was examined by a Park District engineer and the operator of a grading rig. The material was directed to the dump site, the larger varieties of rubble being confined to the water areas and the more selective materials such as the coarse clay and broken concrete to the roadway and land areas. About 65 per cent of the fill area was over the lake basin extending out to a bulkhead constructed off shore. The lowest point of the fill foundation



● The northward extension of Lincoln Park was undertaken on "made" land, to provide for extension of Lake Shore Drive. Filling here described is for the entire shore strip beyond the Foster Avenue overpass (see in foreground) and between buildings and the breakwater.

which was minus 11 ft. below city datum, was in this area. The highest point was located at the Foster Ave. bridge which was plus 22 ft.

To prevent objectionable material from entering lake waters, the U. S.

Corps of Engineers required diking to contain all below-water fills. Semi-circular dikes were built up off-shore and the trucks dumped their loads from the dike rims to complete the fills.

● Under-water filling was dozed into place behind protective dikes first constructed under Corps of Engineers requirements.





● Four truck cranes team up to reset a ready-mix plant tower on new foundation.

All grading was done under park district supervision with equipment rented from the W. J. Sheppard Co. The equipment used included 8 Caterpillar D8 dozers, four Le Tourneau 12-yd. scrapers and four double-drum Sheppard sheeps-foot rollers. A highly satisfactory subgrade material was obtained for the Lake Shore Drive roadway extension by mixing the clay, broken concrete and stone fragments together. This material was spread in 12-in. lifts by the dozers, the rollers then compacting with about six passes to attain a density 90 per cent of standard. The interlocking effect of the angular stone material decidedly heightened the load-bearing qualities of the subgrade. The two approaches to the Foster Ave. bridge were 700 ft. long on a 2.5 per cent grade. The side slopes, which were shaped by D8s and scrapers, were 1:4 or flatter in some places to hold the grass.

To sum up the results of transporting this great amount of fill through

some of the busiest sections of Chicago, observers were struck with the smoothness of the operation. Minor complaints about truck noises were met by keeping haul routes away from residential areas as much as possible.

Another complaint was that of excessive spillage, made by the Department of Streets. This was overcome by keeping a close check on overloadings.

That the hauling caused some deterioration to street surfaces cannot be denied, but when it is recognized that, in terms of yardage, this was one of the largest single earth-hauling jobs in the city's history, a degree of deterioration was unavoidable. Certainly, the hauling operation was an efficient one as was exhibited by the fast pace it set to accomplish completion late in 1954.

In charge of the fill operation for the Chicago Park District is Geo. T. Donoghue, general superintendent, and R. A. Black, chief engineer.

## Another tricky crane job handled successfully

What you see here isn't a church steeple but the housing for the concrete plant of a ready-mix firm at Saginaw, Michigan. It didn't weigh overly much, but lifting this framed unit and resetting it on a new concrete foundation required some careful synchronization on the part of the four crane operators involved.

The job was handled jointly by W. F. McNally Co., contractor, of Saginaw, who furnished one crane, and by cranes from Detroit Crane Service, Dobson of Bay City, and a fourth crane, each with 70 ft. booms, made up the team.

Not much detail to report, except that the job was first attempted with two cranes, whereupon it was decided to use four rigs for greater safety and handling capacity.

## ASTM committee on paving materials

The development of suitable standards for establishing the proper quality of materials used in road and highway construction has played an important part in highway development. Committee D-4 on Road and Paving Materials of the American Society for Testing Materials can feel justly proud in its contribution. The committee commemorated its 50th Anniversary on February 5 during ASTM Committee Week in Washington, D. C.

Committee D-4 was one of the three original technical committees of ASTM, known as Committee "H", when first authorized in 1903. The membership has grown from an original 20 to 154. Its scope has expanded in keeping with the expansion in types of road materials and construction introduced during this period.

Following its business meeting on February 5, the committee conducted a commemorative program in which the early history of the committee was reviewed by Stanton Walker, a long-time and active member of the committee and a member of the Society's Board of Directors. Length of service on the committee was recognized through the reading of the names of all members with 20 or more years of service, and special recognition shown 14 members with 30 or more years of service. A specially prepared citation was presented to each of these 14 members. Among this group present was Allan W. Dow, the only living charter member of the committee and the oldest living member of the Society, with a membership dating back to 1898.

# Electrical Subsurface Exploration Simplified

By H. E. Barnes

Assistant Laboratory Supervisor  
Michigan State Highway Department  
Testing Laboratory, Ann Arbor, Mich.

IN the last several years the necessity for improving the quality of highway construction has increased the need for more detailed and accurate information with regard to the actual soil conditions involved in highway construction. Also, in connection with highway construction, it is becoming more evident that the known sources of available granular material for road surfacings and base courses are rapidly becoming depleted. These two conditions have awakened the engineers engaged in highway construction into realizing that there is a great need for improved methods of subsurface explorations.

The Michigan State Highway Department personnel, aware of these circumstances, also recognized that a study should be made of exploration methods. Consequently, in 1949 an electrical resistivity instrument was purchased in order to determine whether this type of geophysical exploration could be satisfactorily adapted to the requirements of the highway engineering field. After a period of experimentation using conventional methods of interpretation, it was found that the results were not entirely satisfactory. Therefore, the investigation was expanded to determine the possibilities of developing a method more applicable to the Department's needs. This investigation was successful to the extent that an entirely new method of interpretation, which is the subject of this article, was developed.

## General Equation

All electrical methods of subsurface exploration are based on a correlation between certain electrical values and the classes or types of soil for which these values are obtained. The means by which the electrical values are obtained and the manner of interpretation vary considerably among the geophysicists and engineers.

In 1952 the writer<sup>1</sup> demonstrated an equation for determining the resistivity of individual layers of soil. This equation was the result of two years of investigation and experimentation and had been used in practice for a sufficient length of time to prove its merits. The equation was stated in such a manner as to be applicable to the type of instrument which measures the current and potential differential simultaneously. This equation is expressed in the accompanying formula.

$$\rho_{Ln} = 2\pi A'k \frac{E_n}{I_n - \frac{E_n}{\bar{R}_{n-1}}} \quad (\text{Eq. 1})$$

where

$\rho_L$  = resistivity in ohm-centimeters of any individual layer

$A'$  = depth or thickness in feet of the layer interval

$I_n$  = current input in amperes through the outer or current electrodes

$E_n$  = potential differential in volts measured across the inner or potential electrodes.

$\bar{R}_{n-1}$  = average resistance in ohms of the soil mass lying between the ground surface and the bottom of the layer just above the layer being investigated

$k$  = conversion constant for converting feet to centimeters

$n$  = number of any individual layer

Although this is the general form for determining the value of resistivity for an individual layer, the computations for a complete sounding can be greatly facilitated by expressing the equation in a simplified form and in terms of conductance. This expression is as follows:

$$1/\bar{R}_n = 1/\bar{R}_{n-1} + 1/\bar{R}_{n-1} \quad (\text{Eq. 2})$$

where

$1/\bar{R}_n$  = conductance of any individual layer of soil measured in mhos

$1/\bar{R}_{n-1}$  = conductance in mhos of the mass of soil between the ground surface and the bottom of the  $n$  layer

$1/\bar{R}_{n-1}$  = conductance in mhos of the mass of soil between the ground surface and the bottom of the layer just above the  $n$  layer

In order to clarify the use of this new method of resistivity interpretation, an example was selected from a cut-section consisting of three Stations, A, B, and C, which was investigated to a depth of 18 feet. For demonstration purposes the results at Station A will be worked out. Following the practice used by the Department, a 3-foot layer interval was used for

making the sounding. To obtain information about the first layer of three feet, the electrodes were placed in a straight line three feet apart with the inner two electrodes spaced 1.5 feet equidistant about the station point as shown in Figure 1. With the instrument properly connected, a reading of 0.00728 mho was obtained. (See Table 1.)

At this point it should be made clear that the conductance readings obtained in the field are not for the individual 3-foot layers of soil, but for the soil mass lying between the ground surface and a depth equal to the spacing between the electrodes.

## Setting Electrodes

The next step consisted of setting the electrodes 6 feet apart, centered about Station A, and taking a reading for this depth. The reading was 0.01088 mho and represented the average conductance of the top 6 feet of soil. These steps were continued by successively spreading the electrode spacing equivalent to the depth of soil measured until the last step was reached. For the last step in this example, the electrodes were spaced 18 feet apart, making the end or outer electrodes 27 feet from the point of Station A.

Continuing with the example, reference is made to Table 1, in which are given the results obtained at all three stations.

The next step in the general procedure of computation is to determine the value of conductance for each of the individual layers using Equation 2. The value for the first 3-foot layer does not require computing inasmuch as it was obtained directly in the field. For Station A this value was 0.00728 mho. The second and all subsequent layers must be computed by Equation 2 as follows:

$$\begin{aligned} 1/\bar{R}_2 &= 1/\bar{R}_1 + 1/\bar{R}_1 \quad (\text{from Eq. 2}) \\ &= 0.01088 - 0.00728 \\ &= 0.00360 \text{ mho} \end{aligned}$$

The value of conductance for the last layer lying between 15 and 18 feet is found in the same manner as above.

TABLE 1

Total Depth (Ft.)	Layer Thickness (Ft.)	Layer Number	Electrode Spacing (Ft.)	Values of Conductance in mhos (1/Ω)		
				Sta. A	Sta. B	Sta. C
3	3	1	3	0.00728	0.00366	0.00598
6	3	2	6	0.01088	0.00926	0.01251
9	3	3	9	0.02703	0.02105	0.01749
12	3	4	12	0.06957	0.04553	0.02575
15	3	5	15	0.11920	0.08370	0.03514
18	3	6	18	0.18480	0.12595	0.04701



$$\begin{aligned} 1/R_6 &= 1/\bar{R}_6 - 1/\bar{R}_5 \\ &= 0.18480 - 0.11920 \\ &= 0.06560 \text{ mho} \end{aligned}$$

Conductance values for all layers in the example are shown in Table 2.

### Interpretation of Data

After computing the respective values of conductance for each of the individual layers, there still remains the problem of determining the types of soil represented and the location of the contacts or boundaries between them. This is accomplished with the use of a correlation table which can only be established from field experience. The correlation values will vary from one area to another, due to differences in soil compositions and moisture contents. It has been found in Michigan that the soils in some areas located in the Upper Peninsula have resistivity values as much as ten times the magnitude of values of similar soil textures found in the Lower Peninsula. It should be emphasized that a working correlation table can be established rather quickly by making a few auger borings in conjunction with the resistivity survey, with which comparisons can be made. Table 3 gives the correlation values established for the soil conditions existing in the greater part of the Lower Peninsula of Michigan.

Using Table 3 as a reference, the contact locations for each of the three soundings may now be determined. Experience has shown that plotting can be facilitated if the conductance values of the individual layers are converted to terms of resistivity. The conversion is accomplished by using a modified form of Equation 1. This modified form is expressed as:

$$(Eq. 3)$$

$$\rho_{L_n} = 2\pi A'k \frac{1}{1/R_n} = 2\pi A'k R_n$$

Using the first layer of Station A as an example, it will be seen that the value of resistivity can be determined as

$$\begin{aligned} \rho_{L_n} &= 2\pi \cdot 3 \cdot (30.5) \cdot (1/0.00728) \\ &= 183\pi \cdot 137.3 \\ &= 79,000 \text{ ohm-cm.} \end{aligned}$$

The resistivity of the second and all subsequent layers is worked out in a similar manner. For the second layer the resistivity is determined by using the value of 0.00360 found in Table 2.

$$\begin{aligned} \rho_{L_n} &= 183\pi \cdot (1/0.00360) \\ &= 183\pi \cdot 277.7 \\ &= 159,000 \text{ ohm-cm.} \end{aligned}$$

The resistivity values for the six layers at Stations A, B, and C are given in Table 4.

The next step is to plot these values against their respective depths in the form of a bar graph as shown in Figure II. Since each layer value is an average for the respective layer, the mid-point may be chosen as a representative reference point. These

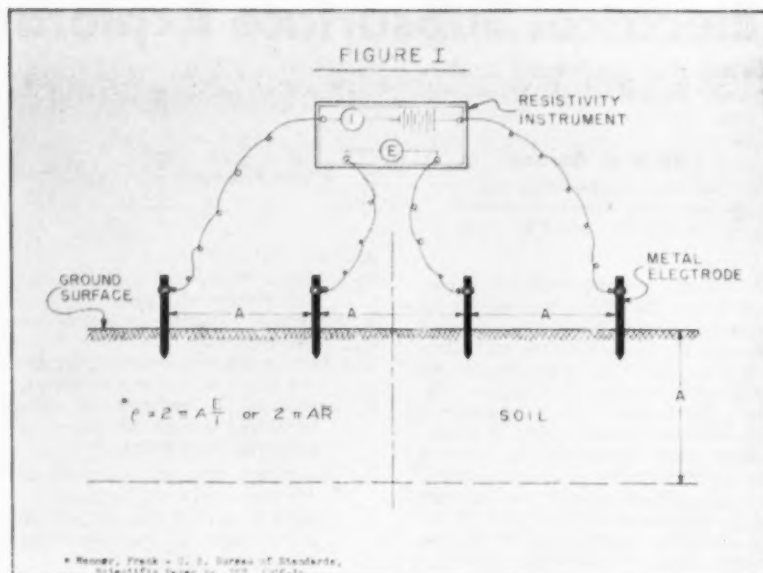
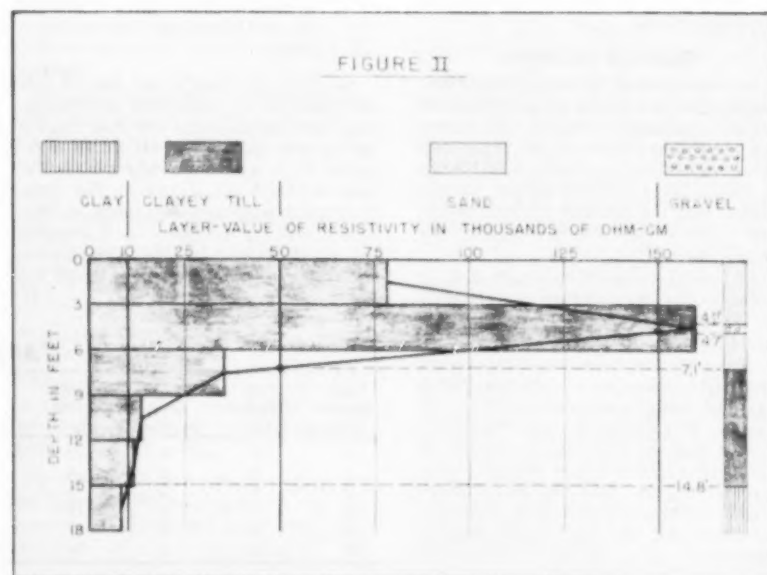


TABLE 2

Layer (ft.)	Values of Conductance in Mhos (1/R) for Individual Layers		
	Station A	Station B	Station C
0-3	0.00728	0.00366	0.00598
3-6	0.00360	0.00560	0.00653
6-9	0.01615	0.01179	0.00498
9-12	0.04254	0.02448	0.00826
12-15	0.04963	0.03817	0.00939
15-18	0.06560	0.04225	0.01187

TABLE 3

Resistivity (ohm-cm.)	Conductance (mhos)	Soil Types (Lower Peninsula)
0-10,000	$\infty$ -.05730	Clay and Saturated Silt
10,000-50,000	.05730-.01146	Clayey Till and Saturated Sand
50,000-150,000	.01146-.00382	Sand
150,000-500,000	.00382-.00115	Gravel



points are now connected by straight lines called "transition lines." The intersection of the transition lines with the range limit lines automatically determines the elevation of the boundaries between the various soil types.

After the boundary points have been located for each sounding, it is a simple matter to connect similar boundary points from sounding to sounding to form profile-contours which define the locations and quantities of the various soils encountered as shown on Figure III. The result is a cross-sectional view of the profile and is the final product of the resistivity interpretation.

With reference to field procedure, it is the practice of the Department to make soundings at every 100-foot station along the centerline of proposed cut-sections for new highway construction. Surveys of proposed borrow sites are made by setting up parallel traverses from 100 to 200 feet apart and taking soundings at points 100 to 200 feet along the traverses, depending upon the size and general soil conditions of the area.

### Measuring Instruments

Any instrument designed for use with resistivity work can be used with the method of interpretation discussed in this article. There are several instruments available on the market varying in sensitivity, size, weight, and cost. Some are based on supplemental-circuit resistance bridges, some on impedance bridges, etc. Also, there are those which measure the current and potential separately and others which measure the resistance directly. However, until recently there was no instrument on the market to the author's knowledge which read directly the conductance of soil using the 4-electrode configuration. At the present time the Michigan State Highway Department is collaborating with a precision instrument company with the anticipated result that an instrument designed specifically for use with the so-called Barnes Layer Method system will be available for this type of work.

### Advantages of the New System

There are several pertinent advantages afforded by the new interpretation method described in this article which will be discussed separately below.

1. **Type of information obtained.** It can be seen from Figures IV, V, and VI that the profile-contour view of the soil investigated gives a general quantitative knowledge of the type, quantity, and respective locations of the various soils encountered. With this information the designers can more intelligently establish proposed road grades and compute approximate quantities of both good and poor highway materials. With several cross-sectional views through a proposed borrow site, one can determine with

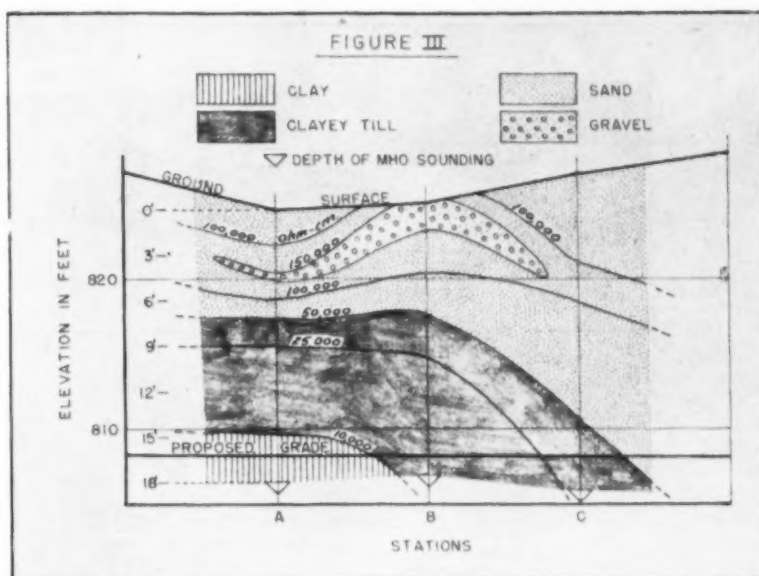


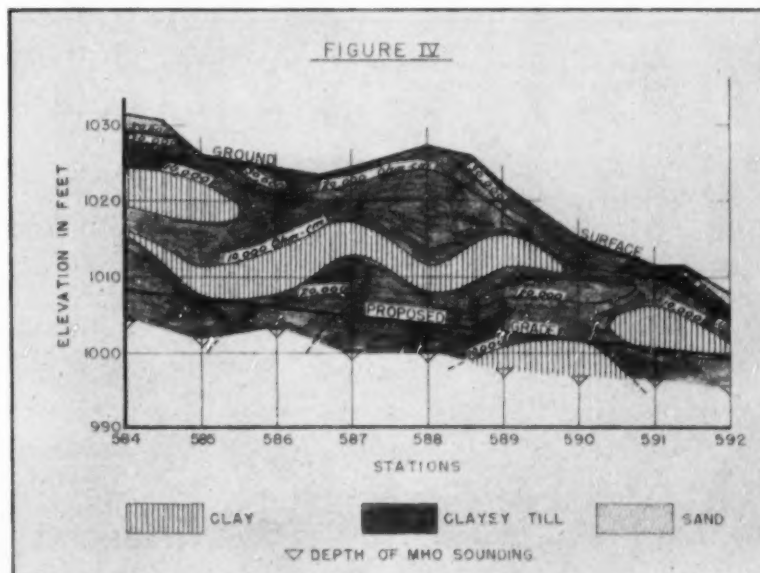
TABLE 4

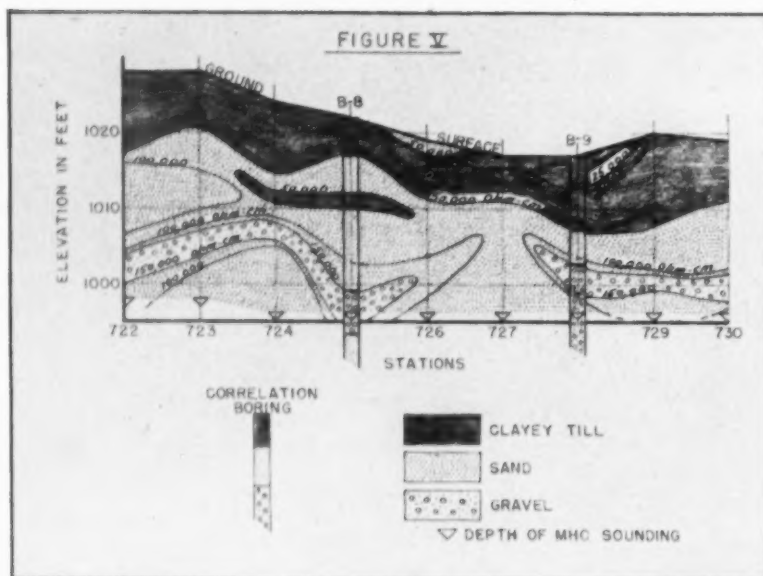
Layer (ft.)	Value of $\rho_L$ in Ohm-Cm. for Individual Layer		
	Station A	Station B	Station C
0-3	79,000	157,100	96,200
3-6	159,000	102,700	88,100
6-9	35,000	48,800	115,500
9-12	13,500	23,500	69,600
12-15	11,600	15,100	61,200
15-18	8,800	13,600	48,400

confidence whether the material meets the requirements for which the borrow is intended. This type of information is also valuable to contractors who use the information in computing costs for bid purposes and for control of their earth moving schedules during construction. In one case a contractor was able to adjust his schedule in such a manner as to move

the heavy soils during moderate weather and reserve the granular materials for winter operations.

Attention is called to the fact that Figures III through VI are portions of actual surveys made in connection with Michigan Highway Projects. During the construction of these projects the actual conditions were observed for comparison with the pre-





dicted conditions. In all cases the predicted conditions were substantiated.

Another important feature of the system is that in most cases boulder concentration zones can be differentiated from bedrock. This is demonstrated by the fact that the contour will close, thus enveloping the boulder zone, whereas the contour about bedrock will not close. (See Figure VI.)

**2. Specialists not required.** Although the success of any electrical exploration method is dependent upon the qualifications of the one who makes the interpretations, this method requires a minimum of experience. Many methods demand the knowledge of experienced geophysicists and mathematicians in the field of earth resistivity to make sound interpretations. The new method, on the other

hand, requires only a general knowledge of geology in order to make interpretations of the electrical values obtained from a "mho" sounding. It is acknowledged, however, that a background in geology will greatly assist the interpreter in making the over-all interpretations.

**3. General knowledge of soil conditions known immediately.** Using this new method of interpretation together with a table of correlation limits established from experience as given in Table II, the soil type in the first layer is known immediately. The general soil type in any subsequent layer ( $x'$ ) can be determined by use of Equation 1 simply by subtracting the value of conductance obtained for the total depth ( $x-1$ ) from the value obtained for the depth ( $x$ ) and com-

paring this difference with the correlation table.

This is in contrast to many electrical methods which do not lend themselves easily to field computations and consequently the survey party may complete the field work having little knowledge of the soil types encountered. This sometimes makes it necessary to return to the field to check questionable sections or areas. The return trip is necessary because the soil conditions are not known until the office force has completed the computations.

**4. Time required to make surveys and reports.** The use of the new system has substantially reduced the length of time required to produce the final reports. Since readings of conductance are read directly, only one figure is recorded instead of two and several steps of calculations are eliminated. Although it is more convenient to plot the bar graph in terms of resistivity rather than in mhos, the operation of determining these values ( $\rho_L$ ) is very simple. As demonstrated in Equation 3, the resistivity ( $\rho_L$ ) for any layer of three-foot thickness is found by dividing the constant 575 by the mho value. For layers of five-foot thickness, the constant is  $2 \pi \times 5 \times (12 \times 2.54)$  equals 960.

**5. Cost of surveys:** Next to the value of information obtained, the cost of surveys is probably the second important item of consideration. Costs will vary depending upon the size of the project and the type of information desired. Single soundings will necessarily cost much more than production surveys prorated for single soundings. An analysis of the surveys conducted by the Michigan State Highway Department for the year 1952 is given below.

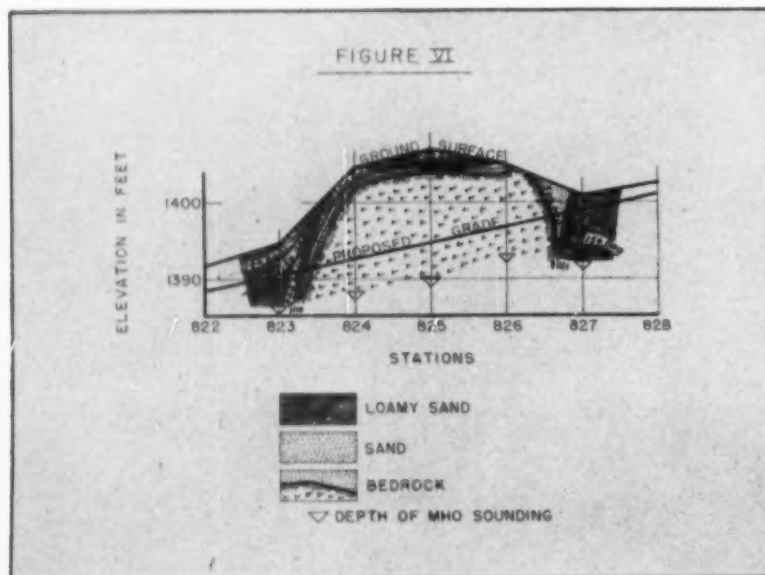
Number of soundings made	800
Number of miles represented	15
Lineal feet of sounding depth	24,000
Average depth of sounding, in feet	30
Cost per lineal foot of depth, in cents	70

(The cost item above includes labor, rental and incidentals for the index and confirmation borings made with a mobile continuous-flight auger unit.)

### Conclusions

During the last fifteen or twenty years, several state highway departments have attempted to use earth resistivity for subsurface explorations with varying degrees of success. By giving a description of this new method, by which entire profiles can be produced simply and with a high degree of accuracy, it is anticipated that a greater use of this particular type of exploration may be encouraged. The new method is easy to handle, and enables those not highly skilled in the field of resistivity to make intelligent and accurate interpretations of the field data. It is believed that county organizations with

(Continued on page 140)





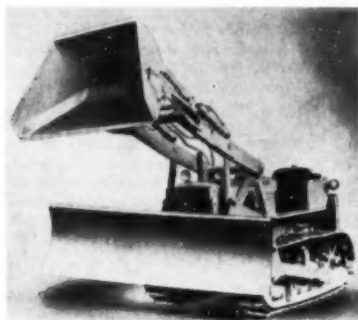
# WHAT'S NEW

## in EQUIPMENT and MATERIALS

*Use bound-in postcard for convenience in inquiring about these products or those described on advertising pages.*

### Tractor Shovel

A new larger size Terra-Bulldozer, announced by American Tractor Corporation, Churubusco, Ind., has a  $\frac{3}{4}$  yd. digging bucket and 7 ft. 4 in. angledozer or 6 ft. bulldozer. The bucket operates as a digging loader, leveler, materials handling loader and backfiller. The ATC special bucket is tapered for self-cleansing in even the stickiest soils. The independent angledozer or bulldozer attachment incorporates the design features of large equipment. Close coupled, direct hydraulic linkage permits precision performance when pushing heavy loads or land leveling or grading.



New Model Terra-Bulldozer

### New Two Wheeled Rear Dump Trailer

Athey has introduced a large two-wheeled rear dump trailer specially designed for Caterpillar's DW21. This trailer, the PR21, will haul 33 cu. yd. of any material or 35 tons at a top speed of 20 mph. The height is 9'5" front and 6'1/2" rear. It is constructed of  $\frac{3}{8}$ -in. high strength steel with a bottom of  $\frac{3}{4}$ -in. armor plate heavy, oak filler and a  $\frac{1}{2}$ -in. bottom plate.

The trailer was designed to give it maximum stability yet be able to perform economically. This was done by making the axle the pivot point for the dumping operation. This operation is carried out by two Athey 3-stage hydraulic double-acting cylinders. They lift the body to a 60 deg. angle, more than enough to spill the load. Brakes on all four wheels are operated individually or simultaneously, giving the driver complete control.

Power steering permits the combination to turn 90 deg. in either direction for an exceptionally low turning radius of 16'9" with the body down or 13'5" with the body raised. Power for dumping is supplied by a 55 gpm. pump mounted on the back of the tractor giving the operator completely controlled dumping.

The tractor contains all of the standard features found on the DW21.

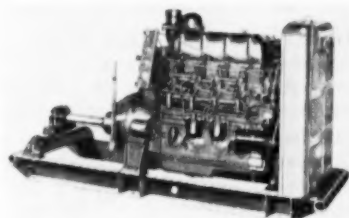
The engine rated at 225 hp. with top of 275 hp. under peak load. It has been designed to burn commercial burner oil.



P&H's New Diesel Engine Plant

### P&H Introduces New Improved Diesels

Announcement is made by Frank Edwards, General Manager, P&H Diesel Engine Division, that Harnischfeger Corporation is now in production with a complete improved line of 2-cycle diesel engines featuring 36% greater power output. While

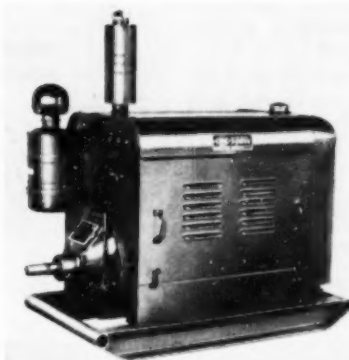


P&H 4-cyl. Model 487C-18 power unit

Most important change is the improved cylinder assembly. This is completely redesigned for much improved efficiency and far longer service. More effective and complete scavenging, achieved by a new valving arrangement and redesigned porting which imparts greater turbulence, further adds to performance.

Cooling capacity has been much increased over former models through the enlargement of water passages and the addition of new channels in vital areas.

A special alloy cast iron now used for the liners keeps vital surfaces "oil wet" at all times. The steel jackets, also new, are Parkerized for maximum corrosion resistance. These, like all components in the redesigned liner assembly, can be replaced



P&H 3-cyl. Model 387C-18 power unit.



New Athey Rear Dump Trailer

# the SEAMAN MIXER

## STABILIZES Base and Sub-Base Movement

### ... Saves Maintenance or Costly Reconstruction

The most usual causes of base course and surface failures are weak spots in the subgrade. These can readily be prevented with a low cost stabilization of the sub-base soils. This process provides:

1. The elimination of coarse and fine pockets of soils.
2. An even "blending out" of wet and dry spots.
3. An increase in the uniformity of load bearing value throughout all the subgrade.

If aggregates or binders are also mixed-in, the stability is greatly improved. In either case the subgrade materials are mixed, blended and mechanically stabilized for maximum support of the base.

For maximum benefit, the aggregates of *all sizes* of the base course must be mixed, blended and interlocked. Thus the finer sizes act as a soil-mortar to unite the mixture into a solid mass. No separation, no cracking, no faulting.

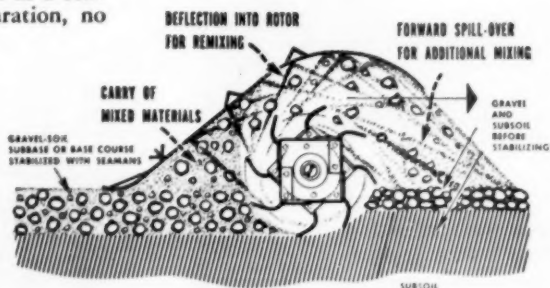
This mechanical stabilization is economically accomplished with the SEAMAN PULVI-MIXER.

Moreover, this processing also *stabilizes movement of the base and sub-base*. If weather action occurs in the sub-base, the movement it causes is wholly uniform and the base course flexes with it.

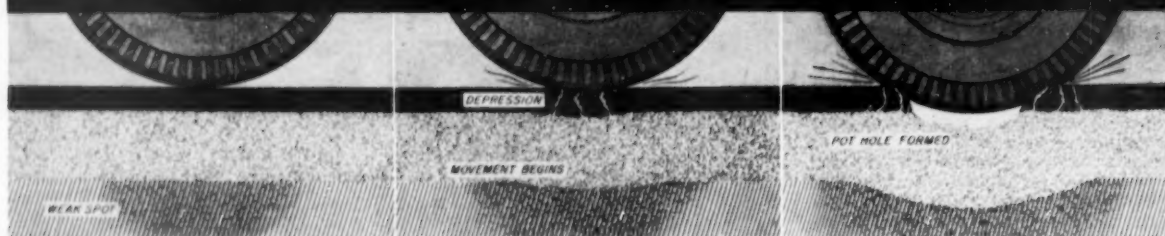
A 12-page Bulletin describing the Self-Propelled TRAV-L-PLANT and the Self-Propelled MIXER is yours FREE on request. It also shows how gravel segregation occurs and how it may be corrected. Ask for Bulletin TP5. Send a postcard today.



The SEAMAN Self-Propelled MIXER. 7 ft. mixing width. Gasoline or diesel powered.



## PREVENT THIS BY STABILIZING THE SUB-BASE



Moisture has entered the unstabilized sub-base causing a weak spot. This would not occur if sub-base had been stabilized to uniformity and high density.

The expansion through freezing or the breakdown of the sub-base through the disintegrating effect of moisture is reflected in a localized movement of the materials above in the base.

Complete breakdown of the base course above the sub-base failure has started a chain reaction as more moisture will permeate the fault and establish repeated breakdown cycles along the width and length of the pavement.

**SEAMAN MOTORS, INC.** 291 N. 25th STREET • MILWAUKEE 3, WISCONSIN

separately in the field.

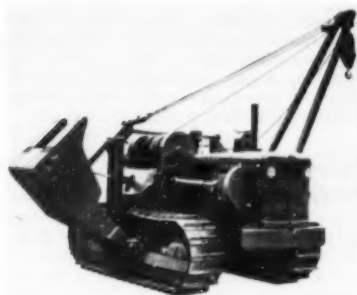
Other major refinements include new design of the combustion chamber for clean, thorough combustion. Pistons are now flat on top. Camshaft design is improved for better timing, easier starting and more r.p.m. Injectors are changed and have special tips developed by P&H which provide a soft spray pattern with a single hole. There is new exhaust manifolding which provides more effective carry-away.

Horsepower ratings at 1800 rpm. range from 58 to 255. Displacement is 87 cu. in. per cylinder. Stressing the low weight of the new engines, P&H releases these figures to show the very low ratio of weight to power. The six-cylinder model weighs 1800 lb., for 7.06 lb. per h.p. The four-cylinder model weighs 1500 lb., with 8.33 lb. per h.p. For the three- and two-cylinder engines the figures are 1190 and 975 total weight, 9.30 lb. and 12.50 lb. per h.p.

For more complete information on P&H Diesel Engines write the P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Illinois.

### Side Boom for Crawler Tractor

A new side boom for mounting on the Allis-Chalmers HD-9F tractor, with a 38,000 lb. lifting capacity at 4 ft. overhang, has been announced by Tractomotive Corporation, Deerfield, Ill. Among many design improvements, Tractomotive Corporation has introduced two major features in this unit which are claimed to be new to the side boom field. The first is a front-mounted power take-off which has several advantages. It means the power is taken from a live shaft so that the side boom works independently of the tractor master clutch. Further, the front power take-off leaves the back of the tractor free for installation of a winch or other rear-mounted equipment which is often required in this size machine. The second new feature of the TSB-9 is the twin clutch arrangement on the power take-off. This arrangement consists of two multiple plate Twin Disc clutches, one for raise and one for lower. By merely pulling one lever, the operator can change from "raise" through "neutral" to "power down" on either the load or boom line. No gear shifting is necessary.



TSB-9 Side Boom on A-C HD9F Tractor

### Four New Tractor-Drawn Scrapers

A complete line of four new open bowl tractor-drawn scrapers has been introduced by Wooldridge Manufacturing Co., Sunnyvale, Calif., providing a heaped capacity range from 10.5 to 25.0 cu. yd. Low center of gravity, high ground clearance, wide apron opening, latest application of the "boiling bowl" loading principle and



Model OS-80 Scraper

positive full power forward pivot-tilt ejection are said to be among principle design characteristics. Completely new are the Wooldridge Model OS-80 with capacities of 10.5 cu. yd. heaped and 8.4 struck and the OS-90, 15.0 cu. yd. heaped and 12.2 struck. Model OS-152, which has seen considerable service since first introduction early in

1953, is claimed to reflect several design advances and is now rated at 18.0 cu. yd. heaped and 15.1 struck. The fourth and largest new model is the OS-200 with a heaped capacity of 25.0 cu. yd. and struck rating of 20.0 cu. yd.

### Rear Mounted Power Control Unit

A new medium duty rear mounted power control unit, Model 261, has been announced by Gar Wood Industries, Inc., Mattoon Division, Wayne, Mich. The model 261 is patterned after the field-tested heavy duty Gar Wood Model 281 cable control unit and offers similar exclusive features. It is designed for dependable, economical dozer or scraper work with tractors between 40 and 130 HP.



*Will You Get Your Fair Share?*

### \* MOBILE DRILL'S B-27 CAN PUT YOU OUT FRONT IN THE COMPETITIVE BIDDING!

Contract-winning bids are bids based on facts. Put a versatile, fast-working Mobile Drill B-27 to work making economical exploratory tests. When you know earth formations you can figure your bid to the penny. You'll be winning contracts over the stiffest competition and insuring your profits. 43 State Highway Departments use Mobile Drills in their preliminary investigations—real proof of Mobile's stellar performance.

You Can Own Your Own MOBILE B-27 for as little as \$1,100.00. Available with Hydraulic or Hand Feeds

- \* Mounts on Jeep or 4WD Truck. Drills Holes up to 6" in diameter. No set-up time required. Quick to move. One man can operate.



WRITE FOR COMPLETE INFORMATION ON THE MOBILE DRILL MODEL B-27

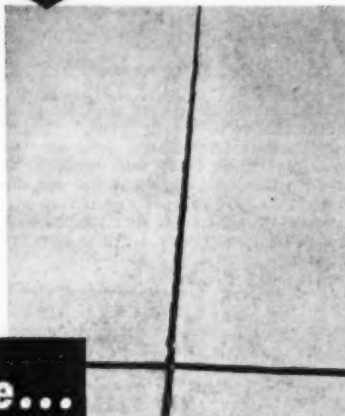
960 NORTH PENNSYLVANIA ST., INDIANAPOLIS 4, INDIANA  
WORLD'S LARGEST MANUFACTURER OF LIGHT VEHICLE POWERED DRILLS





Old joint filled with a hot poured type sealer. Note cracks which permit water penetration through joint.

Tightly bonded joint uniformly sealed with cold applied Presstite No. 77, forming impervious barrier against water infiltration.



**See the difference...**

## when paving joints are sealed with Cold Applied **PRESSTITE No. 77**

To reduce paving maintenance costs, resulting from havoc wrought by repeated expansion and contraction of pavement, Presstite's Research Laboratory developed a *cold applied* paving joint sealer... Presstite No. 77.

Proven on more and more highway and airport paving jobs, Presstite No. 77 has conclusively demonstrated its superiority for sealing joints in new pavement and for maintenance re-sealing. It remains flexible, resilient and adhesive, withstands repeated expansion and contraction of the pavement, and forms an impervious barrier against passage of water through the joints and into the sub-grade below.

Quick, easy and economical to apply, Presstite No. 77 remains tough and elastic under extremes of temperature and heavy traffic.

Here is a proven paving joint sealer that provides longer lasting, more satisfactory pavement service, resulting in greater maintenance economy.

**WRITE TODAY** for new catalog and full details on cold applied paving joint sealers.



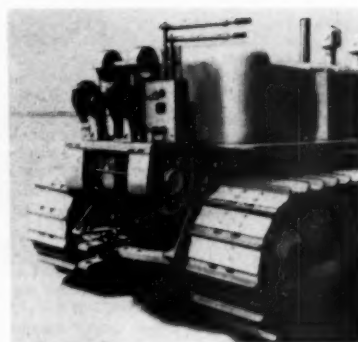
Re-sealing runway paving joints at Davenport, Iowa, Municipal Airport. Presstite No. 77 is quickly and easily pumped under pressure directly from drum into joints.



**PRESSTITE ENGINEERING COMPANY**

3782 Chouteau

St. Louis 10, Missouri

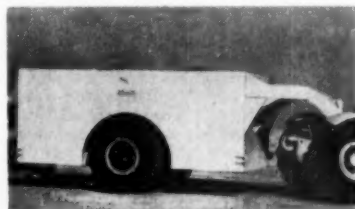


Model 261 Rear Mounted Power Control Unit

The 261 incorporates planetary type gearing for fast, accurate control and smooth, positive operation. Starts and stops are smooth but powerful, since power transmission is positive and unfailing from one gear to another. The absence of jerking eliminates excessive strain on the cable and lengthens cable life, and eliminates operator fatigue. The large-capacity cable drums have large bare drum diameter to further insure long cable life. Line pull for bare drum is 5000 lbs., while full drum pull is 2600 lb. The 261 large cable capacity drums handle 268 ft. of  $\frac{1}{2}$  in. cable.

### 50-Ton Pneumatic Roller

The improved Model W18R 50-ton pneumatic roller of W. E. Grace Mfg. Co., 6007 S. Lamar St., Dallas, Tex., is now available with a bolt-on tongue, making it



Model W18R 50-Ton Roller

adaptable for use with either crawler tractors or large rubber-tired tractors. This model has four 18.00 x 25 24-ply tires on oscillating axles. Weight of the unit is 9 tons, empty. Loading to 50 tons with sand or gravel is accomplished without heaping, according to the manufacturer.

### New Principles in Hopper Spreader

In a new Model LMC hopper type spreader, announced by Flink Co., Streator, Ill., unusual engineering features are stated to be involved. The gear drive con-



Model LMC Spreader

sists of two helically cut steel pinion gears operating on a single helically cut ring gear, in oil, in a sealed housing. There are no worm gears nor miter gears regardless of whether the power is derived from the power take off or from a separate air-cooled engine. (It is available with either type drive). The conveyor is driven from both sides, power being equalized through a differential. All drives are "straight-in-line" which is accomplished by running the main shaft in oil in a sealed tube through the center of the hopper. Patents are being applied for on its principles.

#### Rollers Work Within 1 1/4 in. of Curb

A new 2-ton roller capable of rolling within 1 1/4 in. of curbing, wall or any other vertical obstruction has been introduced by Andwall Manufacturing Co., Oconomowoc, Wis. Any man can ready this equipment for trailing behind any truck at any speed. This is accomplished by the hydrau-



Andwall 2-Ton Roller

lic lift which raises the 36 in. 4,100 lb. roller off the ground. Wheels with pneumatic tires support the roller for quick transport from job to job. The roller concentrates its weight on the main roller and provides a compaction pressure of 100 lb. per lineal inch. The water drum capacity is 800 lb. and the tank holds 220 lb. The roller is powered by a 11.2 H.P. 2-cylinder air-cooled Wisconsin motor.

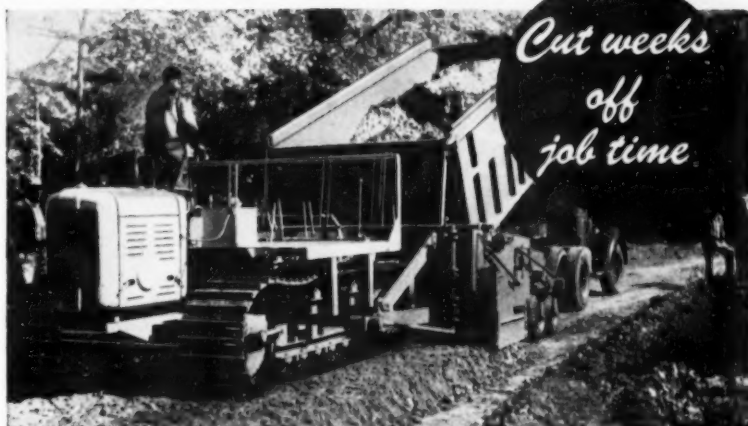
#### Land Clearing Rake for Shovel Loader Mounting

A land clearing rake especially adapted for mounting on shovel loaders has been developed by Rockland Allied Equipment Corp., Harborside Park, Providence 5, R. I. Removable and replaceable teeth with adjustable side-spacing provide clear penetration below main beam of 18 in. This rake is claimed to open an entirely new field with tremendous possibilities, particularly in gravel pits where conservation of top soil is of paramount importance. The rake is also available for all other makes and models of crawler and rubber-tired tractors.



Model RF-2 Rake Mounted on Allis-Chalmers ND-9G Shovel Loader Working in Gravel Pit

## BLAW-KNOX BASE PAVERS



### MODEL P-150 LAYS BASE PAVEMENT UP TO 400 TONS PER HOUR

• Base course paving is fast, accurate and economical with this high tonnage producer. You can spread stone, slag, gravel, soil cement or crusher run aggregates to depths up to 20" and widths up to 16' in one pass, with no separation of material. There's plenty of traction and power to push your trucks, yet flotation for the softest surfaces. Oscillating action of the V-type screed "knits" material into the voids for accurately level and smooth base courses. Operating costs are low. Hand dressing behind the unit is reduced to the minimum. Blaw-Knox Apsco Base Pavers are available in two models to meet every base pavement requirement. Write for complete details in Bulletins 2457 and 2459.

#### BLAW-KNOX APSCO ROAD WIDENERS

These heavy-duty time and labor saving units handle concrete without forms, asphaltic concrete and any kind of aggregate. They spread and finish concrete up to 1 1/2 miles per day . . . build earth shoulders at the rate of 200 tons per hour. Two sizes available to meet your needs. Send for Bulletin 2458.

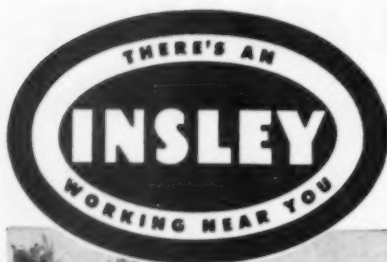


Ask your BLAW-KNOX DISTRIBUTOR  
about the "Complete Packages" of Concrete Paving  
and Ready-Mixed Concrete Equipment

#### BLAW-KNOX COMPANY BLAW-KNOX EQUIPMENT DIVISION

PITTSBURGH 38, PENNSYLVANIA  
Offices in Principal Cities





## ON A LOADING OPERATION



Shown here is a Type WB Shovel

The Insley Manufacturing Corporation has been manufacturing construction equipment since 1907. The Insley Line includes excavators and cranes, 5 to 30 ton capacity—crawler or rubber mounted. There's an Insley working near you on a loading operation.

**INSLEY MANUFACTURING CORP. • INDIANAPOLIS**

wholly owned subsidiary  
THE MAXI CORPORATION, LOS ANGELES

### Road Danger Lamp

A new Chalwyn road danger lamp, announced by Wm. W. Lee & Son, 20 East Jackson Blvd., Chicago 4, Ill., is specially recommended for use where danger lamps



Chalwyn Road Danger Lamp

are subject to hard usage. It burns 45 hours on  $\frac{1}{8}$  pint of kerosene. It is fitted with three red bulls eye lenses and is painted red with white borders around the lenses. It is stated to be wind and rain proof. The height to top of handle is 19 in., height of body 12 in., width of body  $5\frac{1}{2}$  in. sq. and the weight is 5 lb.

### It Measures While You Walk

A new series of improved calibrated wheels, tradenamed Distometer, and providing high speed, accurate methods of measurement has been recently perfected by Rolatape, Inc., 1741 Fourteenth St., Santa Monica, Calif. Most popular of the units is Model 200, which is exactly 2 ft. in circumference and registers up to 100 ft. and then repeats the cycle. The Distometer Model 400 provides a measuring wheel exactly 4 ft. in circumference and registers distances up to 100,000 ft. Model 600 is also available with a measuring wheel 6 ft. in circumference for rougher terrain.



Three Models of Distometer Measuring Machine



### Construction Equipment Trailer

A new tandem axle "Tilt-Top" with 10 ton capacity has been announced by Miller Research Engineers, 432 South 92nd St.,

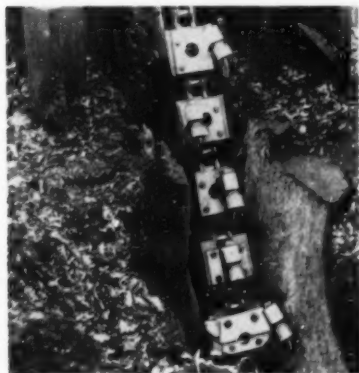


Model BT-10 Trailer

Milwaukee 14, Wis. The manufacturer reports that this new trailer is of particularly massive construction and design, using tapered side channels in the frame that are 14½ in. deep at center. The platform's rear edge, the tongue gooseneck, and wheel assembly "walking beam" are all box section construction. The "walking beam" member in the tandem axle wheel assembly is considered to be one of the special features of this new trailer. A heavy box section beam on each side of the frame pivots independently on a 4¼ in. solid high carbon steel stub shaft projecting through the frame's side. The "walking beam" proper carries oversize 3½ in. dia. stub axles at each end for the wheels. This design is said to provide rugged support for heavy loads, and permits the tandem wheels on each side to rise and fall over uneven terrain independently, thus reducing jarring and permitting a more level ride.

### Chisel Cutter for Trencher

A new type of chisel cutter for its tractor mounted trencher, the Blackhawk Trench Hog, has been introduced by Arps Corporation, New Holstein, Wis. The chisel cutter is designed especially for digging in hard pan, adobe clay, caliche, frozen ground and very tough conditions. The cutters are forged of high carbon steel and are heat treated for extreme toughness. The cutters are inserted in brackets bolted to the cutter chain. The cutting bits, when worn, are simply and quickly knocked out of the hold brackets, and are just as easily replaced by new, inexpensive bits. They can dig 8 in. through 18 in. wide. The new cutters supplement the standard, slicer cutters used for wet, sticky soils, gumbo, heavy clay and normal soils.



Chisel Cutters Digging Through Solid 22 in. Solid Elm Stump

## WELLMAN STONE GRAB



*Moves  
the "big ones"  
faster!*

**T**HE Wellman Stone Grab thrives on rugged work. This tough grab is built with three jaws for gripping big, irregular-shaped stones with speed and safety. Develops tremendous closing force in its jaws. Welded construction and alloy steels give great strength with minimum dead weight. Available in 5, 10 and 15 ton sizes.

## THE WELLMAN ENGINEERING CO.

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| <input type="checkbox"/> Clamshell Buckets | <input type="checkbox"/> Stone Grabs |
| <input type="checkbox"/> Dragline Buckets  | <input type="checkbox"/> Log Grabs   |

Your Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Position \_\_\_\_\_ Company \_\_\_\_\_

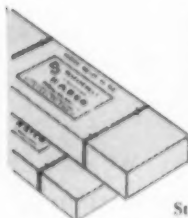
# Lock 'Em Together!



*Eliminate the Danger  
of Tilting and Spalling*

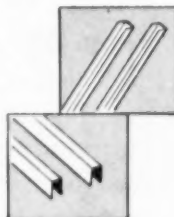
## with **KAPCO** TONGUE and GROOVE JOINT

Pre-formed Kapco Tongue and Groove Joint provides the keyed action essential to maximum load transmission. This non-extruding joint is extensively used as either center strip or contraction joint and is especially suitable for the "lane-at-a-time" method of construction for highways, airports and industrial floors. Rigid control of the quality of asphalt and other ingredients provides added rigidity, ease of handling and absolute uniformity.



Kapco Tongue and Groove comes neatly packed in steel strapped cartons which provide easy transportation and storage as well as protection on the job site. The joint is constructed of  $\frac{1}{4}$ " asphalt mastic board in standard lengths of 10'-1". Widths vary to accommodate standard practice of using joint which is  $\frac{1}{2}$ " narrower than the depth of the concrete slab. Standard punch is 2'-6" on centers for  $\frac{1}{2}$ " dowel bars and 24" on centers for stakes.

Stake pins for Kapco Tongue and Groove are  $\frac{1}{4}$ " channel type, 15" long, 300 pins to a bag. 12 gauge installing cap plate is available in standard 5 or 10' lengths.



Order separately or in combination with other Kapco products which include famous Kapco Asphalt, Fibre or Fiberglass Expansion Joint, Kapco Rubber Asphalt Joint Sealer, Kapco Concrete Curing Compound, etc., etc., etc.

For your convenience why not order *all* of your expansion joints, joint sealers and curing compounds from *one* source!

**WE GUARANTEE PROMPT SERVICE!**



# KEYSTONE ASPHALT PRODUCTS COMPANY

**DIVISION OF AMERICAN-MARIETTA COMPANY**

General Offices: American-Marietta Building, 101 East Ontario Street, Chicago 11, Illinois

### New Cat D2 Tractor

A heavier, more powerful D2, capable of pushing or pulling nearly 8000 lb., has been announced by Caterpillar Tractor Co., Peoria 8, Ill. Drawbar horsepower in the new Cat D2 tractor has been increased from 32 to 35 and belt horsepower is up to 42. Total weight of the machine has been increased approximately 525 lb. The machine will accomplish more work than a 35 to 40 HP wheel tractor, the company claims. Partially this is true because there are 1460 sq. in. of steel track to grip the ground. Overall length has been increased 6 $\frac{1}{4}$  in. and two more track sections have been added. As a result of the increased length, it is now possible to re-

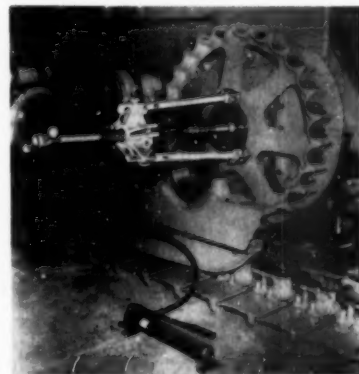


New Cat D2 Tractor Equipped with Heavy Chisels

move the fly-wheel clutch without disturbing the engine. The seat has also been moved forward for better access to the rear of the steering clutch case. Other improvements in Caterpillar's "long" D2 include a track carrier roller and heavy duty fenders as standard equipment and an under-the-seat tool box.

### 50-Ton Sprocket Pullers

A new sprocket puller and installer to fit Allis-Chalmers, International-Harvester and Caterpillar industrial tractors has been announced by the Owatonna Tool Co., 417 Cedar St., Owatonna, Minn. Powered by the OTC 50 ton power-twin hydraulic ram, one basic unit with available attachments will remove drive sprockets on these makes quickly and with little effort. These portable OTC hydraulic sprocket pullers can be operated by one man in the field or



OTC 50 Ton Sprocket Puller

in the shop with equal ease. Three types of pumps are available to activate the ram, a single speed hand pump, a three speed hand pump and an electrically driven pump, all of which operate at 10,000 P.S.I. Contractors, dealers or shops who have the OTC 50 ton ram need order only the sprocket pulling and installing group to do this work since the 50 ton ram is interchangeable with these units.

### New Front for ¾ yd. Shovel

An alternate rope crowd front for its Model 375 ¾ yd. shovel is now being offered by American Hoist & Derrick Co., 63 South Robert St., St. Paul 1, Minn. The new front features a box section type boom with large diameter boom point sheaves and wide rugged cast steel boom foot. The single rigid dipper stick is stated to have proved itself ideal in heavy, rugged digging. Pitch angle of the dipper can be changed to suit the operator by simply removing one pin and replacing it at the new angle.



Model 375 ¾ Yd. Shovel

### Wide Range of Transit Mixers

The Transo Division of LeROI Co., 1706 South 68th St., Milwaukee 14, Wis., is now offering a wide range of new mixer and agitator models for truck or skid mounting. The seven sizes of the new mixer line range from 3 to 6½ yd. in capacity. Features claimed for the new line include: unequaled mixing action due to superior blading, ease in handling, faster charging, speedy discharging, shock free starting, and ease of reversal of drum rotation with full load. The patented drum drive with its planetary reversing transmission is an exclusive feature of this line of mixers. Transo mixers and agitators feature spring loaded clutches running in oil, dual mixing and agitating speeds, dual discharge speeds, and direct mixer drive.



LeROI Transo 4½ Yd. Mixer

### Backfill Tampers

A newly designed backfill tamper, known as W-18, and a new Triplex tamper, known as WT-18, have been announced by Worthington Corporation, Harrison, N. J. The features emphasized are smooth exteriors free from nuts, bolts or other projections likely to interfere with the operator; new, positive acting disc valve providing consistent action; positive lock on the gland nut keeps the front end tight and the packing adjusted as set; built-in lubricator with large capacity oil supply. The company also claims lower air consumption and low maintenance costs for the new tampers.



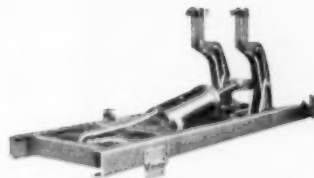
**...Marion Heavy-Duty Bodies  
and Hoists lead  
the field in Performance •  
Dependability • Economy**

It takes a mighty tough dump body to stand up under the severe abuse of day after day hauling and dumping. And it takes a powerful, heavy-duty hoist to give dependable, long-life dumping action.

Marion "Designed on the Job" bodies are made to stand abuse. No matter what kind of load, Marion Bodies are constructed to "take it."

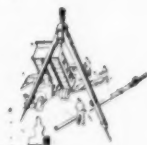
With the Marion Heavy-Duty Hydraulic Hoist, there's guaranteed dependability . . . efficiency . . . and long-life operation — found in all Marion "Designed on the Job" hoists.

Find out for yourself why more and more truck owners are switching to Marions. See your nearby Marion distributor . . . or write direct . . . today.



There's no finer combination for handling your big hauling and dumping problems than a Heavy-Duty Marion Body and Hoist. Designed for compactness and strength, Marion HD hoists handle more work at a low, uniform oil pressure throughout the dumping cycle.

There are no high surge points any time. They have patented equalizing double arm lifts . . . combination oscillating cylinders and roller-type mechanisms. The heavy box sub-frames are constructed of steel for added strength and durability.



*"Designed on the Job"*

**MARION METAL PRODUCTS CO.**

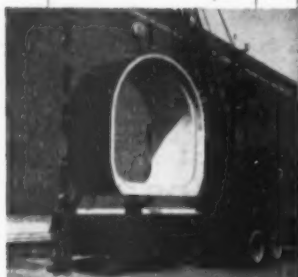
Marion, Ohio, U. S. A.

**MARION**  
BODIES AND HOISTS

A complete line of standard and special Hydraulic Hoists and Dump Bodies To Fit Every Need



# flatten cost curves with UNIVERSAL Flat-base pipe



conduits



highways



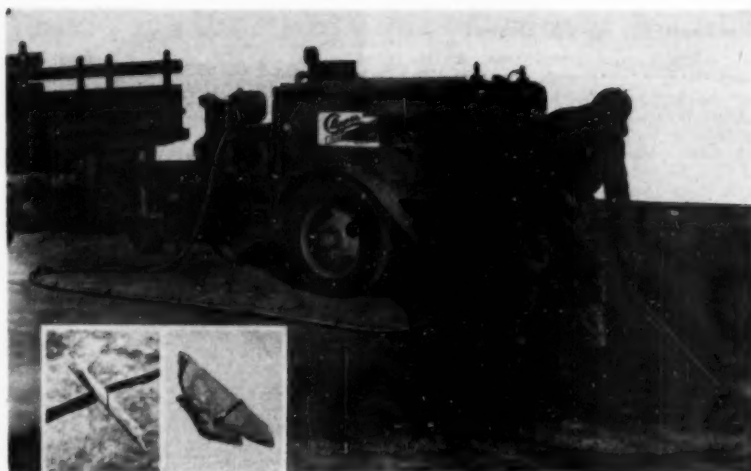
industry

Pre-cast concrete pipe saves up to 30% over built-in-place methods. Easy installation. Up to 100 feet of UNIVERSAL Flat-base pipe can be laid and covered in one day!

Built for heavy duty, low maintenance. Flatten your cost curves . . . specify UNIVERSAL Flat-base concrete pipe. Write . . . we'll tell you more.

## THE UNIVERSAL CONCRETE PIPE COMPANY

297 SOUTH HIGH STREET  
COLUMBUS 15, OHIO  
A subsidiary of the American-Marietta Co.



Clipper Joint Sealer

### Pressure Type Joint Sealer

A new joint sealer, announced by Clipper Manufacturing Co., 2800 Warwick Blvd., Kansas City 8, Mo., combines in one compact heavy duty unit all the equipment necessary for properly melting the sealing compound and for its correct application under controlled pressure. The heart of the sealer is an oil-jacketed, tube fired "double boiler" kettle, designed for the fast and safe heating of rubber base asphalt compound. Heating is accomplished by multiple horizontal torch type burners, using bottled propane gas. Kettle capacity is 165 gal. and the melting production is 40 gal. per hour. Equipment includes a high pressure asphalt pump with built in pressure by pass valve.

The sealer has a newly developed applicator bar, tipped with special alloy heat-treated steel heavy duty unit all widths for use in contraction joints  $\frac{1}{4}$  in. and wider. The melted compound, discharged from either side of the kettle, is forced through a flexible hose to the nozzle. Here the rate of flow is easily controlled by the operator, right at the point of application.

It is stated that in normal working day, the sealer will seal approximately 2 miles of sawed contraction joints of any width. Designed primarily for  $\frac{1}{4}$  in. wide sawed joints, the use of controlled pressure is stated to give positive penetration and protection, regardless of the width or depth of the cut.

### Bituminous Mixing Plant

A new self-contained highly-portable twin-shaft continuous-flow bituminous mixing unit, designed for "Commercial" type jobs, has been announced by Iowa Manufacturing Co., Cedar Rapids, Ia. With capacities rated up to approximately 40 tons per hour, depending on type of mix, specified mixing time and capacity of drying and feeding time, the new Cedarapids Model CM commercial mixer is designed for such jobs as patching, surfacing parking lots, driveways, alleys, school yards, tennis courts, etc. In the operation illustrated, material is fed into the Cedarapids 3612 "Package" drier from a two-compartment hopper equipped with a reciprocating feeder.

Adjustable bin gates proportion the aggregate according to specifications. The independent enclosed bucket elevator delivers multiple hot mix aggregates to the twin-shaft, continuous-type mixer where it is mixed to specifications with a constant flow of bitumen from the weight calibrated metering pump on the mixing unit. The bucket elevator can also be arranged for cold mix applications or to use a weight calibrated apron feeder on the mixing unit for single aggregate hot mix.

### Blasthole Drill

A new blast hole drill, the Challenger, announced by the Joy Manufacturing Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa., is claimed to have the largest hammer

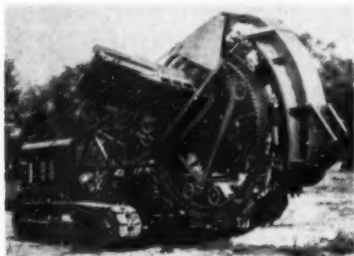


Cedarapids Model CM Commercial Mixer

drill yet designed. It is stated the Challenger will drill  $4\frac{1}{2}$  in. diameter holes to depths of 50 ft. or more in any type of formation, including hard igneous or metamorphic rocks. A  $5\frac{1}{4}$  in. hammer-type drill, mounted on a 26-ft. feed to give 20-ft. steel changes, furnishes ample drilling power for this capacity.

### Heavy-Duty Wheel Type Ditches

A new pipeline and utility ditcher, the Buckeye model 315, has been announced by Gar Wood Industries, Inc., Findlay Division, Findlay, O. The Buckeye 315, a heavy-duty, wheel-type ditcher is designed to dig to a maximum depth of 6 ft. with widths of cut varying from 24 in. to 40 in.



Buckeye 315 Ditcher

in steps of 2 in. The machine has 8 digging speeds forward, from 1.37 to 20.49 ft. a minute. Independent wheel and crawler speeds make the machine exceptionally flexible, since maximum or minimum speed of either is available with maximum or minimum speed of the other. A heavy-duty diesel engine, 76 hp at 1600 rpm, powers the Buckeye 315; a gas engine, 80 hp at 1600 rpm, is optional.

### Rust Preventative

A new type of rust preventative lead coating, known as Blakled, announced by U. S. Steel Supply Division, United States Steel Corporation, is believed to be the answer to the corrosion problem of rusting of steel. Blakled is neither a conventional paint skin nor a pigment ground into a vehicle. It "fills in" the surface of steel and actually replaces moisture and air on a steel surface, thus eliminating the principal cause of rust. Blakled may be successfully applied to wet, brushed rusted surfaces, dry or light mill scaled steel. It dries in an hour, may be dipped, sprayed or brushed and saves in maintenance costs.

### Bonding Rubber Gaskets to Concrete Pipe

A new adhesive, claimed to provide more positive anchorage of rubber gaskets to concrete pipe even under extreme climatic conditions has been developed by Rubber & Asbestos Corp., Dept. P, 225 Belleville Ave., Bloomfield, N. J. The new product, trade-named "BondMaster 158C", is reported to offer more uniform application characteristics, particularly in overcoming hot weather difficulties ordinarily encountered due to evaporation of solvents. In addition to the slower solvent evaporation rate, BondMaster 158C is said to permit smoother and faster trowelling in the field than has been possible with previously existing formulations for this work.



Think what

*Flintseal*\* **saves you**  
**per mile of joints**

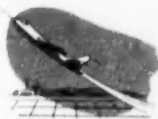
For mile after mile of trouble-free and economical concrete pavement joints, specify FLINTSEAL.

A rubber-asphalt hot-poured compound, Flintseal *holds* its bond and *seals out water positively* through all weather. Won't crack or fail in cold. Won't flow or smear in heat. Stays extensible and compressible through expansion and contraction of the pavement slabs. Remember, for every mile of pavement you have approximately two miles of joints.

One application of Flintseal lasts for years . . . and years. That's how you can save.

#### And specify FLINTSEAL JFR

(jet fuel resistant) to seal joints in critical areas on air fields.



Both FLINTSEAL and FLINTSEAL JFR meet State and Federal specifications.

★ Send for complete technical information today.

\*Reg. U. S. Pat. Off.

Over 50 Years Specialized Experience at Your Service . . . by 'phone, mail or personal call. No obligation.



## FLINTKOTE

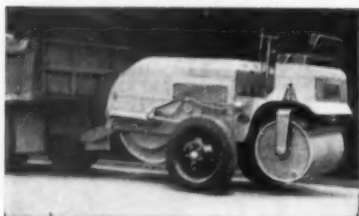


THE FLINTKOTE COMPANY, Industrial Products Division, 30 Rockefeller Plaza, New York 20, N. Y.; 55th & Alameda Sts., Los Angeles 54, Calif.

The Flintkote Co. of Canada, Ltd.—Toronto, Ontario

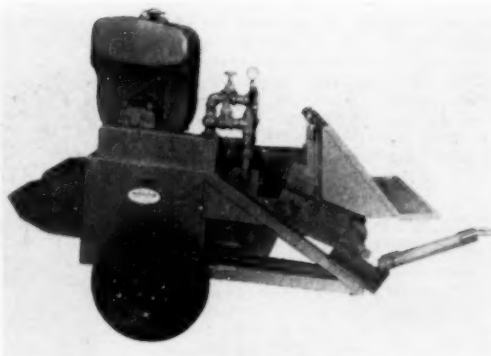
## Retractable Wheel Tandem Roller

The variable weight (4-6 ton) tandem rollers of The Gallion Iron Works & Mfg.



Gallion Tandem Roller with Retractable Wheels

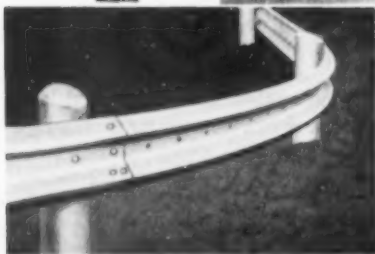
Co., Gallion, O., now have the important advantage of easy portability from job to job. This has been made possible by including a set of hydraulically retractable, rubber-tire transport wheels, which permit speedy and safe towing of the roller behind any truck. Quick and easy raising of the complete roller unit off the ground is accomplished by simple fingertip hydraulic control. A built-in hydraulic jack in truck hitch raises compression roll, and the retractable transport wheels raise the steering roll.



Model JR-54 Mixer



Are *Curves* bothering you in specifying beam type guard rail?



## U·S·F Barrier-Beam HIGHWAY GUARD RAIL

Yes, indeed, USF Barrier Beam has the dependable strength and impact resistance of a beam section. Nevertheless, designing it for curves is easy. Straight sections are all you need for curve radii of 150' or over. Shop forming for any radius from 20' r to 150' r is readily available.

Erection is simple, for no tension is involved, and no special tools or attachments are needed.

If curves are troublesome, specify rugged USF Barrier-Beam. Its ease of installation and maintenance make it a natural for straightaways, too.

Write for Full Details.

# U S F

UNITED STEEL FABRICATORS, INC.

WOOSTER, OHIO

PRODUCTS

Hollow Metal Doors • Prefabricated Metal Buildings • Window Walls  
Highway Guard Rail • Bridge Flooring • Corrugated Metal Pipe

## Portable Asphalt Mixer

A new model JR-54 multi-pug portable asphalt mixer has been announced by K. E. McConaughay, 1205 N. Hayes St., Lafayette, Ind. Second in the line of McConaughay units engineered to handle cold mix, the JR-54 has a capacity up to two tons per minute. Proportioning of asphalt and aggregate is volumetric.

## Lumber Fork for Front End Loader

Production of a new heavy duty lumber fork for its front end loader has been announced by Teale & Co., Dept. R-1, P. O. Box 308, Omaha, Nebr. Addition of hydraulically operated alligator jaws quickly converts it to a large capacity logging fork. Both the lumber and logging fork can be easily attached to the loader arms in a matter of minutes, to replace the regular dirt bucket. Teale and Company have also improved their basic loader. A specially designed manifold type hydraulic oil supply system provides faster, protected flow of oil from detent valve to cylinders, and improves the over-all performance of the loader. Removable alloy steel bushings and "Stress-Proof" steel pins are now being used at all hinge points. A change in the design of the bucket control system increases the angle of dump to 67° below the horizontal, and adds speed and force to the "banging" action at the bucket.



Loader and Lumber Fork in Action

## Cat D7 Tractor Has Increased Power

An increase of horsepower in the Cat D7 track-type tractor has been announced by Caterpillar Tractor Co., Peoria 8, Ill. The engine brake horsepower at sea level has been increased from 98 to 108 at 1000 rpm. With this change, the tractor drawbar horsepower is increased from 81 to 90.

(Continued on page 98)





Like all Austin-Western Power Graders, the new Super "BB" has tremendous climbing power in its front drivers.

## Why AUSTIN-WESTERN power graders give you More for Your Money



Ditch cuts around sharp corners—impossible with any other grader—are easy for the Austin-Western operator.



Shoulders as wide as 10 feet are finished without leaving tire marks.



Controlled Traction puts the grader in position to move a big windrow up the slope.



With power and directional control at both ends of the machine, riding bunks is much quicker and easier with an Austin-Western.

**Austin-Western**  
Power Graders • Motor Sweepers  
Road Rollers • Hydraulic Cranes



Construction Equipment Division

Manufactured by  
**AUSTIN-WESTERN COMPANY**  
Subsidiary of Baldwin-Lima-Hamilton Corporation  
AURORA, ILLINOIS, U.S.A.

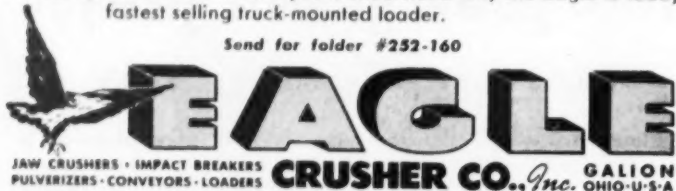
... has a way with windrows



## The EAGLE TRUCK-MOUNTED LOADER

In fact, from roadway to dump truck is a matter of seconds. Gobbles up any loose material — be it dirt, cinders, snow, etc., at a rate of 3 to 5 yards per minute. Only one man to operate it! Discharge chute has 170° swing. Excellent for loading from stockpiles. Job-to-job at truck speeds ... add up these reasons and you'll understand why the Eagle is today's fastest selling truck-mounted loader.

Send for folder #252-160



## STOP JOINT SEAL FAILURES!

Use HOT-POURED  
*Para Plastic*

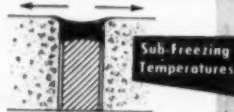
- Para-Plastic keeps joints sealed under severest conditions of traffic, temperature
- May be pumped directly into joint from melting kettle
- Para-Plastic "JF" compound impervious to Jet fuel or petroleum solvents used in aircraft

Use Hot Poured Para-Plastic ... field-proved to be the only effective method of sealing joints with a high degree of permanence. There's no substitute for Para-Plastic ... nothing equals its sealing performance. It's stable, constant in volume, won't break down and maintains bond under virtually every condition. Para-Plastic can now be pumped directly into the joint from the melting kettle—a fast, simple method of application. Write for details on new method and information on Para-Plastic and Para-Plastic JF.

The only FIELD PROVED METHOD  
OF SEALING JOINTS



Temperatures to 180° F do not affect  
Para-Plastic sealing efficiency.



Para-Plastic remains plastic—  
maintains bond at 0° F.



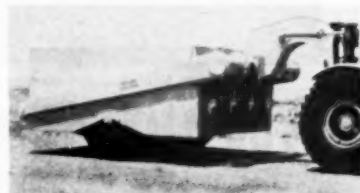
**SERVICED PRODUCTS CORPORATION**  
6051 WEST 65th STREET • CHICAGO 38, ILLINOIS

(Continued from page 96)

The tractor will now develop a drawbar pull of 22,750 lb. The calculated value for the maximum drawbar pull when the engine is lugged down by overload is 25,250 lb.

## Compactor Has New Hauling Yoke

A new flanged hauling yoke on its compaction roller, according to Southwest Welding & Manufacturing Co., Alhambra, Calif., permits changing the draft-beam to match the DW-21 Caterpillar and/or other standard wheel or track-type tractors. The unit has four weight boxes which may be filled with any material to attain a single tire load as high as 53,000 lb. Each of four weight boxes rides on its own wheel and tire. These weight boxes are hinged at the rear to oscillate independently up and down a distance of 12 in. This is stated to permit maximum compaction over the rough, uneven surface of fills without bridging or shifting the compaction load.



Southwest Roller with New Yoke

## Finishing Machine Has Complete Hydraulic Action

A new hydraulic finishing machine, announced by The Flexible Road Joint Machine Co., Warren, O., is claimed to greatly increase the quality of the finished concrete, and also to greatly increase the speed at which concrete pavements can be finished. Other features claimed for the machines are its complete portability, its faster width adjustability, and its simplicity and ease of operation. The machines are manufactured in two standard sizes, one for half width construction, adjustable to 10 to 15 ft.; the other for full width construction, adjustable to 20 to 25 ft. The engine develops 32 hp. at normal engine speed. The finishes has two 12 in. wide screeds, one front and one rear, both mounted outside machine frame. Screeds



Full Width Hydraulic Finishing Machine on  
State Highway Job

are hydraulically driven, each one independent, with infinite range of working speeds from 0 to 100 strokes per minute. The screed strokes are adjustable 0 to 9 in. The machine has all hydraulic fingertip controls. The working speeds are 0 to 24 ft. per minute, infinitely adjustable and its travel speeds are 0 to 220 ft. per minute. The 10 to 15 ft. machine weighs approximately 9500 lb. The 20 to 25 ft. machine weighs approximately 11,500 lb.

## Truck Hoist Increases Payload

A new front-mounted telescopic truck hoist, now being manufactured by Hercules Steel Products Corporation, Gallon,



Hercules Telescopic Truck Hoist

O. is claimed to provide up to 1000 lb. extra legal payload. Designed especially for heavy-duty dump truck bodies 11 to 15 ft. long, this 20-ton capacity hoist shifts hoist weight forward. Thus more load is on the front axle, making possible maximum per-axle loads. The telescopic hoist is manufactured for single or tandem axle straight trucks. It is easily mounted with no part of the hoist extending below the truck frame.

#### Portable Dust Collector for Asphalt Plants

A new Standard Twin 92 in. portable cyclone dust collector, announced by Standard Steel Corporation, P.O. Box 15252, Los Angeles, Calif., is stated to offer peak efficiency in dust collection and tops in



Twin 92 in. Portable Cyclone Dust Collector

portability for 3000-4000 or 5000 lb. asphalt plants. The unit is mounted on its own gooseneck trailer-type frame, and is available with or without running gear. It is especially designed for use with standard truck-size tires, thus permitting interchange with other equipment. Operated with either diesel engine or electric motor drive, the new portable cyclone dust collector is complete with large exhaust fan, dust return screw and fan stack with louver damper for maximum dust control. Complete unit meets all known state highway clearances.

### Manufacturers' Literature

#### Truck Mixers and Tilting Mixer

A new bulletin, covering Blue Brute truck mixers and a specification sheet for the Blue Brute 3½-S end discharge tilting mixer are being offered by the Worthington Corporation, Construction Equipment Division, Plainfield, N. J. The bulletin, No. R1700-B13, thoroughly describes and illustrates both the LC and LO models of inclined-axis truck mounted concrete mix-



**..How to CLEAN Under a Bridge**

You can clean under bridges and culverts . . . remove sediment from storm sewers . . . work in places which do not allow the head room other machines require . . . efficiently, economically . . . with a Sauerman Crescent Scraper powered by a skid mounted Sauerman Hoist or your tractor or boom machine hoist.

The Crescent, working between an anchorage and the hoist, will deposit excavated material anywhere along the span simply by reversing the forward pull. Through an opening no larger than its own width, the Crescent can be started through an underpass. It digs equally well on firm ground, boggy material or under water.

For full details, illustrations and representative cost figures on the use of a Crescent Scraper with your tractor, write for Field Report 209. For information on the use of Crescent Scrapers with draglines, request Field Report 219 and Catalog J.

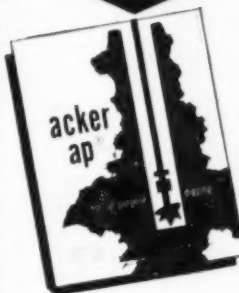
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acker's new  
all-purpose  
digger**

Send the coupon today for your copy of our new catalog showing the wide range of application as well as the many exclusive features that make the Acker All-Purpose Digger the most versatile and useful you can buy!

**TWO MODELS TO CHOOSE FROM** — Jeep mounting with compact, power take-off or skid-mounted with self contained power plant for truck mounting.

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# SAVED! 152 Man Hrs.!

## REDUCED . . . 190 Labor Hours



Patent pending

Tree-man W. S. Rowland cleared 459,800 sq. ft. of 15-ft. California willows from a power-company right-of-way in 38 hours, with a WILTON Motor-Powered Brush Saw! He writes of his men's experience with a Wilton, clearing 100% over 2 miles long, 30 ft. wide.

Automatic recoil starter  
Blade set at 10° for cutting  
Simple centrifugal clutch  
3500-4000 r.p.m.  
Push-button stop control  
Weight under 30 lbs.

Shoulder strap distributes weight  
2" tubular aluminum shaft with  
1/4" thick wall  
Entire saw fits in car trunk  
Bearings sealed in oil  
Aluminum thigh shield for perfect balance,  
easier guiding

**\$274.50**

FOB, Milford, N. H.

Note how ruggedly, conveniently the Wilton Motor-Powered Brush Saw is designed and built.

Further data sent promptly on request.

MANUFACTURED BY **Williams & Hussey MACHINE CORP.**

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# RUEMELIN BLAST GENERATORS

## FOR CLEANING BRIDGES— WATER TOWERS—STRUCTURAL STEEL



Many contractors use Ruemelin Blast Generators for cleaning steel work to remove rust, paint and scale before repainting. These machines are also used to remove laitance from cement wherever concrete construction is in progress. A wet adapting nozzle can be furnished to convert dry machines to wet type of operation. Built in several sizes.

Write for  
Bulletin 36-C

**RUEMELIN  
MFG. CO.**

3990 N. Palmer St.  
Milwaukee 12, Wis.

Manufacturers  
and Engineers  
SAND BLAST AND  
DUST COLLECTING  
EQUIPMENT  
WELDING FUME  
COLLECTORS

ers. Many of the improved design features of the mixers are illustrated by photographs or cut-away drawings indicating details of each. The truck mixers described in this bulletin are the latest in a long line of mixers engineered and manufactured by Worthington.

## Suggested Headwall Designs

An engineering data sheet on "Suggested Headwall Designs" using steel sheeting with corrugated metal pipe and pipe-arch has been released by Armo Drainage and Metal Products, Inc., Middletown, O. They are frequently used as headwalls for corrugated metal drainage structures under railroads and highways. Drawings, photographs, descriptions, installation notes and physical properties complete the piece.

## Caterpillar Diesel D6 Tractor

A new 36-page booklet (Form 30379) entitled, "Caterpillar Diesel D6 Tractor," has been released by Caterpillar Tractor Co., Peoria 8, Ill. This booklet, with photographs and model cutaways of the basic components of the D6 track-type tractor, describes what goes into making up each component. The booklet is highlighted by a double-page detailed cutaway of the D6 tractor. In addition to a specification sheet and attachment list, the booklet suggests other equipment that may be used with the D6 tractor.

## Construction of Concrete Airports and Highways

The latest methods and equipment used in the construction of concrete airports and highways are outlined in a fully illustrated 20-page booklet (Bulletin M-12) issued by Heltzel Steel Form & Iron Co., Warren, O. The booklet deals primarily with such equipment as automatic batchers and batching plants, new type heavy duty steel forms, fast portable finishing machines, automatic dual and tie bar installations, high speed joint installation, automatic membrane curing, subgrade planing and testing.

## Controlling of Weeds, Grasses and Brush

An up-to-date revision of "You Can't Argue with Weeds" has been issued by Chipman Chemical Co., Dept. 22, Bound Brook, N. J. This 46-page booklet contains helpful information on a wide variety of chemicals currently recommended for weed, grass and brush control—explaining what they are used for and how to use them. In addition, many pages are devoted to illustrations and detailed descriptions of the most troublesome weeds, as well as specific directions for their control. Considerable information on killing brush, trees and stumps is also included.

## New Lima Shovels and Cranes

New descriptive bulletins covering its recently introduced Lima Type 44 and Lima Type 803 machines, are available from Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, O. Type 44 is a 1-yd. machine with a 15-ft. dipper handle and 20-ft. boom. Equipped as a crane, it has a lifting capacity of 25 tons. This machine is available on crawler or rubber mountings. Type 803 is a 2½-yd. machine with an 18-ft. dipper handle and a 24-ft., 6-in. boom. Equipped as a crane, it has a lifting capacity of 50 tons. Capacities, working ranges and brief specifications are included in the bulletins.

**THE "Quinn Standard"**

**FOR CONCRETE PIPE**

The Quinn Standard is known as the best the world over, wherever concrete pipe is produced and used. Backed by over 40 years' service in the hands of hundreds of Quinn-educated contractors, municipal departments and pipe manufacturers who know from experience that Quinn pipe forms and Quinn mixing formulas combine to produce the finest concrete pipe at lowest cost.

**QUINN HEAVY DUTY PIPE FORMS**

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—uses for pipe from 10" up to 120" and larger—longer and groove or bell end pipe at lowest cost.

**WRITE TODAY.** Complete information, prices, and estimates sent on request.

Also manufacturers QUINN CONCRETE PIPE MACHINES

**QUINN WIRE & IRON WORKS 1637 - 12<sup>th</sup> St. Boone, Iowa**

## Specification Bulletins on P & H Diesels

A new series of 2-color bulletins covering the full line of P&H diesel engines has been announced by Harnischfeger Corporation, Diesel Division, Crystal Lake, Ill. The new literature gives condensed information and specifications on this line of 2-cycle diesel engines. There is a separate bulletin for each diesel with pictures of each model or engine and power unit. Marine diesel engines are covered separately. All models, from 20 to 138 HP, 2, 3, 4 and 6 cylinders, are included in the new series of specification bulletins.

## Highway Maintenance with Calcium Chloride

A new booklet, "Highway Maintenance with Calcium Chloride," is being offered by Solvay Process Division, Allied Chemical & Dye Corporation, Advertising and Sales Promotion Department, 63 Broadway, New York 6, N. Y. The booklet combines many charts and pictures with a non-technical description giving practical highwaymen a complete story, season by season, of how to maintain their unpaved roads with calcium chloride. In addition the booklet also lists various other uses for calcium chloride around highway departments.

## Rear and Front-mounted Cable Controls

Caterpillar Cable Controls, both rear and front-mounted, is the subject of a new booklet (Form 30598) released by Caterpillar Tractor Co., Peoria 8, Ill. Several cutaway and model views facilitate illustration of the advantages of No. 24 front-mounted unit and the No. 21, No. 25 and No. 27 rear-mounted controls. Similar in design, all four incorporate the Caterpillar features that mean precise, efficient and trouble-free operation.

## Cable and Hydraulic Dozer and Control Units

A new catalog (Form No. F-165) showing the 15 models of cable and hydraulic dozers and 3 models of control units available for Allis-Chalmers tractors has been announced by Gar Wood Industries, Inc., Customer Service Dept., Wayne, Mich. Catalog is extensively illustrated with cutaways, engineering drawings, detailed and on-the-job photographs. It shows what has been designed into Gar Wood dozers and cable control units, and why, to help equipment owners move the greatest amount of material with their dozers and control units at the lowest possible cost.

## Road Grading Machine

The York Expert Workman is illustrated and described in a 4-page circular issued by York Modern Corporation, Unadilla, N. Y. This machine scarifies, blades and rakes in one operation. It can be used as a combination grader, ditcher and maintainer. Specifications are given in the circular.

## Catalog of Construction and Maintenance Equipment

White Manufacturing Co., 1227 W. Beardsley Ave., Elkhart, Ind., has just issued a 20-page catalog of products embracing asphalt plants and incidental units such as burners and dryers, surface and tool heaters, bituminous kettles, tractor loaders, pug mills, concrete vibrators, and other equipment items. Descriptions, pictures, specifications, index.

## Trailers—10 to 75 Ton Capacities

Trailers in capacities ranging from 10 to 75 tons are illustrated and described in a new 4-page bulletin of Rogers Brothers Corporation, Albion, Pa. One illustration shows a 64 wheel Rogers trailer with 600 tons capacity which hauled a warload of 300 tons over desert sands. Another picture shows a trailer hauling a 55 cu. yd. dipper and dipper stick. The Rogers power-lift detachable gooseneck trailer is featured with illustrations and descriptive matter.

## Air Compressors

A new 6-page, 2-color booklet (Form E) describing Davey Super Chief 315-500-600 c.f.m. models has been announced by Davey Compressor Co., Kent, O. Illustrations show each model in 4-wheel and skid trailer mounted units. Model 315 is included with gasoline and diesel engines. Models 500 and 600 are listed in diesel-powered units only. Complete specifications are listed along with an air requirements table for air tools.

## Seven Pull-Type Scrapers Described

A new 3-color 12-page illustrated catalog has been issued by the Tractor Division of Allis-Chalmers Manufacturing Co., Milwaukee, Wis., covering the line of seven modern pull-type scrapers now available through A-C dealers. Detail views of each of the four units produced at the Cedar Rapids Works are shown, with those of three Gar Wood scrapers. They provide a selection of pull-type earth-moving equipment with struck capacities ranging from 2 to 18 cu. yds., for use with all size crawler tractors in the field today. The catalog also includes complete specifications and other pertinent data on each of seven units.

## How to Cut Trench to Finished Grade

A new 4-page folder (Form RW 103) on the Domotor road widener, a quick change attachment mounted on any motor grader, has been released by Ulrich Products Corporation, Roanoke, Ill. Titled "Cut Your Trench to Finish Grade with Four Motor Grader Passes" the folder is well illustrated with step-by-step photographs. It explains the proper application and use of the Domotor road widener in preparing the widening trench along the edge of a surfaced road which is filled with concrete or asphalt without using forms—resulting in a wider, safer highway at low cost.

## "Blue Book" on Electric Plants

A "Blue Book" of general information on the selection of engine driven electric generating plants has been issued by D. W. (Continued on page 104)

# INCREASE PRODUCTION

keep men at  
efficiency-peak  
with  
plenty of cool  
refreshing water  
served in

## Dixie Cups



- HELPS REDUCE ACCIDENTS due to heat and fatigue.
- AIDS EFFICIENCY the men work refreshed.
- CHECKS CONTAGION, ABSENTEEISM it's individual service.



Dixie Safety Slogans will help your men become more safety conscious.

### Insulated Dixie Water Carrier

Keeps water cool for hours.

Available with dispenser for Dixie Cups of your choice. Use in central location—or it's portable, with shoulder straps.



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# Here . . . Without a Doubt . . . is the **MOST USEFUL BUYING**

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## REASONS WHY:

- Catalogs are **PREFILED**—saving you time and space required to file individual manufacturers' catalogs.
- Also save you the time and inconvenience of writing to manufacturers for catalogs.
- Gives you all the facts needed **BEFORE** you make a buying decision.
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- Buying information 'boiled down'—designed for your convenience.

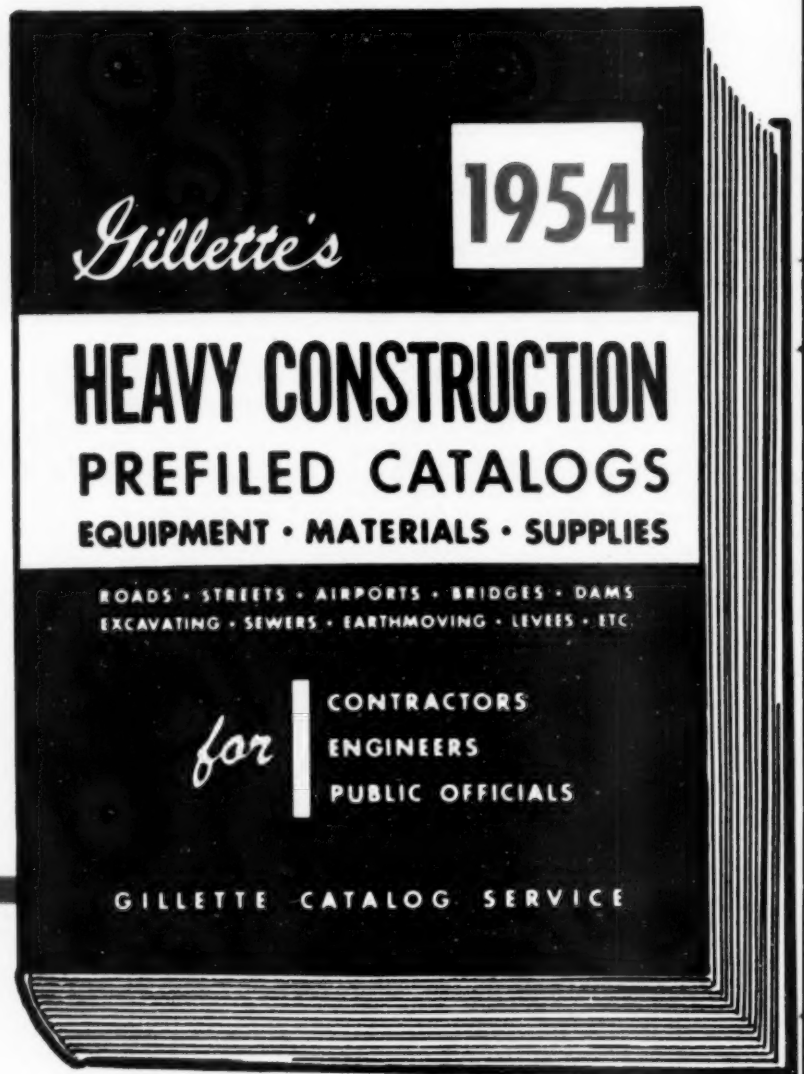
Here are the manufacturers represented in Gillette's Heavy Construction Prefiled Catalog:

Allis-Chalmers  
All Purpose Spreader Company  
American Air Filter Company, Inc.  
American Bosch Corporation  
American Brake Shoe Co.  
American-Coleman Co., The  
American Manganese Steel Division  
American-Marletta Company  
American Steel & Wire  
American Tractor Equipment Corp.  
Anthony Company  
Armco Drainage & Metal Products, Inc.  
Austin-Western Company  
Badger Machine Co.  
Baldwin-Lima-Hamilton Corporation  
Baker-Lull Corp., The  
Ballard Inc., C. L.  
Barber-Greene  
Bicknell Manufacturing Company  
Briscoe & Son, E. V.  
Bros Boller & Mfg. Company, Wm.  
Buda Company, The  
Buffalo-Springfield  
Butler Bin Company  
Carmy Manufacturing Company,  
The Philip  
Chausse Mfg. Company, Inc.  
Chrysler Industrial and Marine  
Engine Corporation  
Clark Equipment Company

Cleaver-Brooks Company  
Cleveland Trencher Co., The  
Clyde Iron Works, Inc.  
Concrete Surfacing Machinery Co.,  
The  
Continental Motors Corporation  
Cummer & Son Company, The F. D.  
Cummins Engine Company, Inc.  
Dann Diesel Corporation  
Detroit Diesel Engine Division  
Dorsey Trailers  
Electric Tapper & Equipment Co.  
Erie Steel Construction Company  
Feltner Manufacturing Co.  
Fiske Brothers Refining Co.  
Flexible Road Joint Machine  
Company, The  
Flintkote Company, The  
Galion Iron Works & Mfg. Company,  
The  
Gar-Bro Manufacturing Co.  
Gar Wood Industries, Inc.  
General Excavator Co.  
General Motors  
Gladhill Road Machinery Company,  
The  
Goodall Rubber Company  
Greenville Steel Car Co.  
H & L Tooth Co.  
Harnischfeger Corporation

Heil Co., The  
Heltzel Steel Form & Iron Company,  
The  
Hercules Motors Corporation  
Herman Nelson Division  
Hough Co., The Frank G.  
Ingersoll-Rand  
International Vibration Company,  
The  
Jackson Vibrators, Inc.  
Jones & Laughlin Steel Corporation  
Joy Manufacturing Company  
Katolight Corporation  
Keystone Asphalt Products Company  
Kiesler Co., Jos. E.  
La Crosse Trailer Corporation  
Laughlin Co., The Thomas  
Le Roi Company  
Littleford Bros., Inc.  
Lubriplate Division  
Madsen Iron Works, Inc.  
Marlow Pumps  
Minneapolis-Moline  
Mottier Printing Press Co., John C.  
Nauvutuck Chemical Division  
Noble Company  
OK Machinery Division  
Omaha Standard  
Osgood-General  
Owen Bucket Co., The

Pacific Car and Foundry Company  
Pioneer Engineering Works, Inc.  
Poor & Company  
Porter, Inc., H. K.  
Proby Company  
Republic Steel Corporation  
Rogers Brothers Corporation  
St. Paul Hydraulic Hoist  
Seaman Motors, Inc.  
Servicised Products Corporation  
Shunk Manufacturing Company  
Sterling Engineering &  
Manufacturing Co.  
Stow Manufacturing Company  
Sumner Equipment Limited  
Symons Clamp & Manufacturing  
Company  
Tarrant Mfg. Co.  
Tilden Tool Mfg. Co.  
Timken Roller Bearing Company, The  
Toncan Culvert  
Transport Trailers, Inc.  
United States Motors Corporation  
United States Rubber Co.  
United States Steel  
Wellman Engineering Company, The  
Winpower Manufacturing Co.  
Wix Corporation  
Wyoming Valley Equipment Co., Inc.  
York Modern Corporation



*Gillette's*

**1954**

## HEAVY CONSTRUCTION PREFILED CATALOGS EQUIPMENT • MATERIALS • SUPPLIES

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**YOU'RE MISSING** an opportunity to save countless hours and DOLLARS . . . the time and energy **SAVED** by using this compact Catalog of heavy construction equipment, materials and supplies.

**YOU'RE MISSING** out on one of the great boons to contractors, engineers and public officials — the advantage of using **ONE PREFILED CATALOG** instead of having to refer to hundreds of catalogs from individual manufacturers.

**YOU'RE MISSING** the benefit of having **ALL** the information you **NEED** at your fingertips **WHEN** you need it. No more need to write manufacturers for individual catalogs or information . . . just look it up in your Gillette Prefiled Catalog.

**YOU'RE MISSING** dozens of time and money-

saving shortcuts. You **DON'T** have to search for information . . . you **DON'T** have to worry about **WHERE** to find certain product specifications . . . you **DON'T** have to make a catalog warehouse out of your office.

**PERHAPS** now you can see why this **ONE CATALOG** offers you so **MANY** advantages . . . saving you both time and money, not only in the mechanical and physical aspects of a cataloging operation . . . **BUT MOST IMPORTANT OF ALL** . . . it is available **WHEN** you **NEED** it . . . **BEFORE** you make your buying decisions! The manufacturers represented in this catalog are literally "meeting" with you in your office—offering you all the information you could possibly need concerning their products. Why not meet them at least half way—and **USE THEIR PREFILED INFORMATION!**

**MAY WE ASK YOU ANOTHER FAVOR?** You'll find a self-mailer reply form in the front of your Catalog. Please fill in the information requested and mail it back to us. This information will actually benefit **YOU** by assuring you of an even better Catalog in the next edition. Thanks for your cooperation.



**MAKE IT BUDGE**

WITH A MAN-SIZED

*Nudge*

Whether you're trying to budge heavy dirt in Illinois, snow in New England or shale in the Carolinas, you can depend on SHUNK blades.

They're rolled from top-quality steel to our own specifications; economical; designed to take heavy punishment.

For almost a century the name SHUNK has been a byword in all parts of the world to everyone concerned with maintenance and construction blades... original equipment manufacturers, contractors, distributors. Let us show you why... specify a SHUNK blade for your job.

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**3,000 DIFFERENT SPECIFICATIONS**



SCARIFIER BLADES



GRADER BLADES



SNOW FLOW BLADES

BULLDOZER BLADES



**Shunk** MANUFACTURING COMPANY  
*In Our 99th Year*

**BEST BLADES MADE**

**BUCYRUS, OHIO**

(Continued from page 101)

Onan & Sons Inc., Minneapolis 14, Minn. Described in simple, easy-to-understand language are the three general groups of electric plants: Alternating Current, Direct Current and Battery Charging. Plant operation for each type is thoroughly discussed. The booklet reviews the three types of prime mover which furnishes the mechanical power for driving the generator, namely: gasoline engine, diesel engine and gas engine. Cost of operation and installation of each type is discussed. Differences of engine cooling are compared, starting methods are described and a concise summary of important points to remember in selection of an electric generating plant is also included.

#### Bulletin on Lorain Power Shovels

A new 12-page bulletin illustrating and describing the Lorain "80" series of power-shovels and cranes has been released by Thew Shovel Co., Lorain, O. These machines are in the 1½ yd. class on shovels. The bulletin covers design and construction features with many pictures (some cutaway) of individual working parts. Action pictures show the machines in the "80" Series at work on jobs throughout the world.

#### Front and Rear Mounted Hydraulic Controls

Three types of Caterpillar hydraulic controls, both front and rear mounted, available for the operation of scrapers, shovels, loaders, tool bar arrangements and agriculture equipment are discussed in a new booklet, Form 30974, issued by Caterpillar Tractor Co., Peoria 8, Ill. The 8-page booklet is complete with cutaways and on the job photographs of these hydraulic controls. Emphasis is on the importance of properly matching the hydraulic unit and track-type tractor.

#### How to Reduce Road Glare

A 6-page brochure on AE Dispersed Black, a darkening agent for concrete pavements that will not neutralize or counteract the air-entrainment, has been published by A. C. Horn Co., Inc., 10th St. and 44th Ave., Long Island City 1, N. Y. Extensive tests of AE Dispersed Black, for compression and flexural strength are stated to show favorable effects in all respects on air-entrainment and flow of mortar or concrete. The brochure gives the detailed data on these tests, as well as uses and recommendations required under varying conditions.

#### New Dipper Trip Speeds Shovel Operations

An electrically operated shovel dipper trip as optional equipment on its line of truck and crawler mounted ¾ cu. yd. shovels has been announced by Schield Bantam Co., Waverly, Ia. Operating speed and efficiency are stated to be increased with the new trip attachment by enabling the operator to swing and dump without changing controls. A thumb-operated push-button switch is mounted on the swing clutch lever, which activates an electric motor mounted on the shovel boom. The motor, in turn, winds up a dipper chain, which trips the bucket dipper. Power is supplied from the basic unit battery through a solenoid arrangement connected to the dipper wind motor. Greater dumping accuracy is made possible with the new device by mounting the control switch on the swing clutch lever.

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**Pitfalls and Pointers in Hot Mix Production**

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**Some Thoughts on Dryers and Aggregate Drying**

**MAY, 1954**



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# PITFALLS AND POINTERS IN Asphaltic Concrete Production

(or-How to be a Hero in a Hot Mix Plant)

By J. Rogers Martin

Engineer-Manager, Hot Mix Asphaltic Concrete Association of Oklahoma, Inc., Oklahoma City

**T**HIS article deals with pointers on how to get a hot mix plant into production, so that the mix conforms to the narrow groove for grading and asphalt content required by so many of our present-day specifications. An example procedure follows.

The plant inspector, the contractor's foreman, and the resident engineer gather in the plant office to pore over a very formidable looking document called the "Mix Design Report." The resident engineer then gives vociferous instructions about how to set the plant. He is very impressive, virtually exuding knowledge about all the intricate details of the operation.

It now comes time to make the actual settings on the plant, whereupon the engineer hurriedly leaves for parts unknown, where he will remain until the plant is in perfect operation.

The inspector and foreman now make settings on the cold-feed bins in accordance with information taken from the "Mix Design Report," run a few tons of the dry material through the pugmill, and run a screen analysis on samples from the hot bins. The respective hot-bin weights are calculated on the basis of the samples and the plant is started to make the first trial mix. This is all in exact accordance with the instructions previously given by the resident engineer.

In weighing out the mix, the coarse bin runs empty long before the proper weight is reached, and the scale needle slowly creeps upward while the other bins are running over rapidly.

The plant foreman, now thoroughly disgusted with this "Scientific Approach," informs the inspector that he knows what weights to use without all this "hog-wash" and resets the weights accordingly.

A trial mix is then made which meets specifications on one screen only—the one which requires 100%

passing. Undaunted, the plant foreman tries a new set of weights, and makes another trial mix, the analysis of which is not much better.

The plant foreman now has a dawning recollection of the manner in which the stockpiles were sampled for the mix design tests. The resident engineer had given him some sacks and asked him to get the samples. The plant foreman had passed the request on to one of his men who, in turn, had his 10-year old boy take the samples. Upon investigation it is discovered that the boy had scooped the samples up with his hands from the edge of the stockpile. The boy's father, who is furnishing this bit of information, asks if there was anything wrong with that.

Too weak to answer and on the brink of defeat, the inspector trudges wearily up the stockpiles and obtains new samples for grading analysis.

## THE INSPECTOR'S MISERY

This is a very trying point in the procedure. In addition to the mental anguish over a complete lack of progress, the inspector is beset with numerous physical discomforts. He has a large knot on his head as a result of walking under the oversize spout just as a two-inch rock was coming out; he has barked his knuckles on the cold-bins, and is covered with dust

to the extent that he would run about 10% passing the 200 mesh sieve. To add to his misery, he has collected in his shoes large quantities of sharp little rocks from his trip over the stockpiles.

The thought of removing these painful little rocks being uppermost in his mind, he looks around for something onto which he can hold with one hand while he removes his shoes with the other. Through sweat-blinded eyes, he dimly sees a small pipe running up the side of the plant which should serve this purpose well. Immediately upon obtaining a firm grip around this pipe, he is violently reminded that it carries high pressure steam at a very high temperature. When he regains consciousness, he is forced to sit down to remove his shoes because his completely incapacitated hand precludes holding on to anything for support.

Only the stout-hearted survive this point in the procedure.

After the analysis of the stockpiles are complete, new cold-feed percentages are derived which call for drastic changes in the cold-feed settings and after a few more difficulties, the plant is finally put "into the groove."

Now that the plant is in perfect operation, the resident engineer emerges from his place of seclusion to give the exhausted, staggering inspec-

Some time ago I was aroused from peaceful slumber at 3 o'clock a.m. to receive a long distance call from a friend who was having a wonderful time! He opened the conversation with the request that I send him one hundred copies of my latest publication, "How to Be a Hero in a Hot Mix Plant." I regretfully informed him that I had not written an article under this heading, but would do so as soon as possible, because it sounded like an excellent title. Here it is. . . .

## HOW TO SAMPLE A STOCKPILE

When it is necessary to sample a stockpile, the following procedure is suggested:

- Take a bulldozer to the top of the pile and knock it off a few feet down so that it is flat for its width and length.
- At a point near one end of the flattened stockpile, begin at the edge and take samples at several equally spaced points across its width. In picking up the samples with the shovel, take small bites, so that no material falls off the shovel while it is being transferred to the sample sack.
- Repeat this procedure at five or more equally spaced points along the stockpile.
- Combine all of the samples and quarter down to produce a sample of about 40 pounds for submission to the laboratory.

for further instructions on the fine points of plant operation; but our valiant inspector does not hear. He is conscious only of the warm glow which comes to every person who conquers great obstacles to become a hero.

For fear that the foregoing account may frighten some prospective plant inspectors into seeking a less trying occupation, it should be said that all of these difficulties can be eliminated through an intelligent approach. The reader may draw his own inference from the writer's confession that all of these incidents have happened to him at one time or another, including the pipe-gripping episode.

Many of the obstacles to setting a plant arise from one of two causes:

- (1) Proceeding on pure guess—or, trial-and-error.
- (2) Proceeding on pure theory and rational calculations.

A combination of the two yields the best results. It is hoped that the following suggestions will enable a few operators to avoid some of the reverses which have faced the writer at various times.

Because the setting of a plant is intimately associated with other operations such as sampling, mix-design, testing, etc., each phase will be discussed in the order that it occurs.

### SAMPLING AGGREGATES FOR THE MIX DESIGN

It happens all too frequently that a laboratory mix design can not be duplicated in the plant, because the aggregate samples furnished to the designer were not representative of the stockpiles. In the milder cases, the result is a bad balance in the hot bins, causing one or two of them to overflow heavily, while one or two others run shy, so that the pugmill operator has to stop the plant periodically to let them fill up. This creates the necessity of adjustments which can be very time consuming. In the more serious cases, the grading just can't be brought inside specifications.

The stockpile sampling method described on this page is particularly recommended for crusher-run or bank-run materials, because it is extremely difficult to get a dependable sample of them by the usual method of gathering "spot" samples from various points on the side of the pile. The writer has found the method to give such dependable samples that the extra labor, and trouble involved, are completely justified.

In sampling aggregates for the mix-design, it is frequently necessary to obtain them before they are stockpiled. In such cases, follow a dependable procedure, such as outlined in AASHTO specification T 2-46. A little extra time and effort spent here, can save expensive delays at the time the Hot Mix plant is put into operation.

### SOME REMARKS ABOUT THE MIX DESIGN

Strict adherence to standard testing methods necessitates a wet screen analysis on all but the coarsest aggregates, because AASHTO specification T 27-46, "Sieve Analysis of Fine and Coarse Aggregates" requires that the minus 200 material be determined by AASHTO T 11-49 which calls for washing with water.

This is a booby-trap. When all of the aggregates going into the mix are completely clean (zero plasticity index), a mix-design grading predicated on the wet analysis is completely satisfactory. However, if the aggregates are border-line on plasticity requirements, such a grading is completely erroneous. This is because washing such a sample with water carries material through the 80 and 200 mesh sieves which remains on the sieves as minute agglomerate lumps when the finished hot mix is extracted and tested for grading. This results in a plant-mix grading which is a great deal coarser for the 80 and 200 mesh sieves than is shown by the theoretical grading derived from the mix design. In some cases, the grading can not be brought into specifications and it is necessary to shut down the plant

until a fine sand or mineral filler can be procured and stockpiled.

The writer has no suggested panacea for producing a mix-design grading which will correspond exactly to plant production in such cases. However, it is a fact that organizations which disregard the standard method and screen their aggregate by the dry method, seldom have any difficulty from this cause. It is true that a mix-design predicated on the dry screen analysis of the aggregates will sometimes be coarser than the actual plant mix, but the discrepancy is small. Some organizations use an average between the wet and dry analysis. Under the latter method, it is advisable to place the design job-formula near the fine side of the grading specifications on the 200 mesh sieve, in those cases where the materials are bordered on plasticity requirements.

### PRODUCTION PROCESS

A person who is responsible for getting a mix into production should have a clear mental picture of the production process. Before proceeding further a review of this will be made.

The major problem in getting a mix into production lies in the grading of the finished mix. The designer, working with a given grading specification, derives a "job-formula" grading which can be made by a combination of the several materials to go into the mix. Once this "job-formula" grading is established, it is required that it be duplicated within rather narrow tolerances. The mix shown in Table 1 will serve as an illustration.

The job formula, as derived by the designer, is shown in Column (6). The maximum allowable variation from this formula is defined by the tolerances shown in Column (7). The absence of a tolerance for the 80 mesh screen indicates that the full range of the general specifications (10-20) in Column (4) is allowed.

The job formula is produced by using 42% of Aggregate A, 38% of Aggregate B, and 20% of Agg. C.

The mix is put into production by the following steps:

- (1) Get an estimate of what the production will be in tons per hour.
- (2) Set the cold-bin gates to deliver *not more* than this total amount and to deliver, as nearly as possible, correct proportion each aggregate.
- (3) Run the plant until the hot bins are at least half full, and empty them. Fill them about half full again, and sample them.
- (4) Run a screen analysis on a sample from each hot bin.
- (5) Combine the bins mathematically to obtain the percentage of each hot bin to go into the mix.
- (6) (a) Batch Plant: Calculate the pounds to be weighed from each bin, and the pounds of asphalt to go into each batch.

(b) Continuous Plant: Determine the rate of addition of the asphalt in gallons per minute, and correct gate opening for each hot bin.

(7) Make a trial batch of asphaltic concrete and run the extraction and grading on it.

(8) Make "differential changes" if necessary, to bring the grading and the asphalt content well within the job formula limits.

## COMPOSITION OF AGGREGATES

The composition or grading of an aggregate for hot mix is nearly always represented in one of two ways.

(1) Total percent passing as shown in Table 1 (a).

(2) Percent passing a screen and retained on the next lower screen, as shown in Table 1 (b).

The composition of the aggregates and the combination is identical in both cases. Also, it will be observed that any individual screen fraction may be obtained from Table 1 (a) by merely subtracting the quantities on adjacent screens. The total per cent passing may be obtained from Table 1 (b) by adding together all the quantities below a given screen.

The illustrative gradings given in this article are shown in the separate fashions, because practice varies over the United States. If the reader is accustomed to thinking in terms of total per cent passing, he may follow that portion of the tables only. Those thinking in terms of per cent passing and retained, may follow the other portion of the tables.

## ILLUSTRATION OF PROCESS

Figure 1 is a flow sheet showing the passage of a "100 pound unit" of aggregate through the plant. The block diagram under each unit represents the composition of the aggregate as it exists in that unit. The composition of each aggregate is shown as individual screen fractions, with each fraction in its respective "slot" on the diagram. For simplification, all material passing the No. 10 screen is shown as one fraction.

It will be observed from the flow sheet that all of the materials "dove-tail" together to form the proper grading in the dryer. However, if an attempt were made to combine the material from the dryer with asphalt to form the finished mix, the mix would not be uniform due to segregation and unavoidable variations in the rate of feed from the cold bins.

For this reason, the material is run over a set of vibrating screens and separated into several different sizes, each size going into a certain hot bin. From two to four separations may be made. A three-bin separation is quite common, such as one shown.

In making the mix, the proper proportion of material is added to the pugmill from each hot bin and from

Table No. 1—Mix Design Data

Aggregate Column No.	A—42% Coarse Stone 1 Total %	B—38% Crusher Run Limestone 2 Total %	C—20% Sand 3 Total %	Spec. Limits 4	Mid-Point Grading 5	Combined Grading (Job Formula) 6 42, 38, 20	Tolerance 7
1 1/2"	100	100	100	100	100	100	
1"	98.8	100	100	90-100	95.0	99.5	+ 5
3/4"	36.2	97.5	100	65-80	72.5	72.2	+ 5
4	6.4	67.1	100	40-55	47.5	48.2	+ 5
10	4.2	48.0	92.1	30-45	37.5	38.3	+ 4
40	3.0	26.0	65.2	20-30	25.0	24.2	+ 3
80	2.6	16.9	24.5	10-20	15.0	12.4	
200	2.1	10.3	3.2	3-7	5.0	5.3	+ 2
Asphalt Content				4.5-6.5		5.0	+ 0.3
(a) Represented as Total % Passing							
%							
Passing-Ret'd							
1 1/2-1	1.2	—	—	0-10	5.0	0.5	
1 - 3/4	62.6	2.5	—	10-35	22.5	27.3	+ 5
3/4 - 4	29.8	30.4	—	15-35	25.0	24.0	+ 5
4 - 10	2.2	19.1	7.9	5-15	10.0	9.9	+ 4
Total % Passing 10 mesh sieve—30-45							
10-40	1.2	22.6	26.9	5-20	12.5	14.1	+ 3
40-80	0.4	9.1	40.7	5-15	10.0	11.8	+ 3
80-200	0.5	6.6	21.3	5-15	10.0	7.1	
Passing 200	2.1	10.3	3.2	3-7	5.0	5.3	+ 2
Ttl. Aggr.	100.0	100.0	100.0		100.0	100.0	
Asphalt Content				4.5-6.5		5.0	+ 0.3
(b) Represented as Individual Screen Fractions							

the asphalt supply after which ingredients are mixed until all particles are well coated.

The illustration shown in Figure 1 is idealized because it shows perfect separation of the various sizes as they come off of the screens. In actual practice, the separation is never perfect because for each screen, some sizes smaller than the screen opening are always trapped and "carried-over" into the hot bin. For this reason, and also because the slant and throw of the vibrating screen reduce the effective size of the opening, a screen with a somewhat larger opening than the nominal size is always employed. For instance, in order to make the mix in our illustration, a contractor might choose to use the following screens: 1 1/2 in., 3/4 in. and No. 4.

The 1 1/2 screen is for scalping out material larger than 1 1/2 in. The material passing the 3/4 in. screen and retained on the No. 4 screen will be predominately 1/2 in. to No. 10 size and the material passing the No. 4 screen will be predominately minus 10 size.

## SETTING METHOD FOR COLD BIN GATES

The proper opening of each cold-bin is usually determined by intelligent trial and error. In cases where

a contractor has previous experience with his bins, he will know about what the opening on each bin should be, to give a specified flow. Some of the equipment manufacturers furnish tables for their bins which will guide the operator in making the initial openings.

If all the cold bin feeds are identical, the initial settings may be made by making the area of each opening in direct proportion to the weight-per cent to be added from that bin, except that the fine bin opening should be increased to about 10% more than its calculated value.

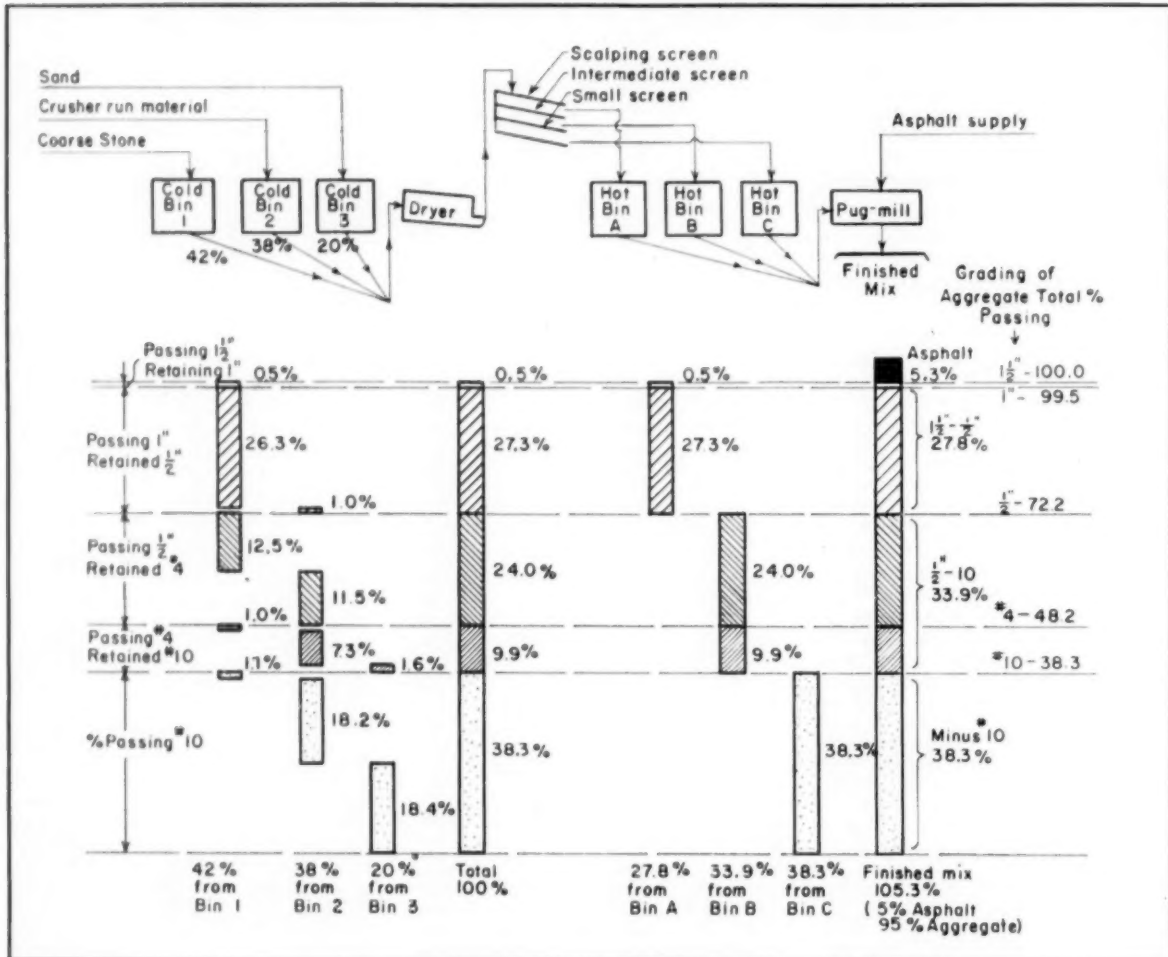
If the materials are carried to the dryer on a belt conveyor, it is a simple matter to check the feed from each bin. Close all the bins except one, which is set at the opening which is believed to be about right. Start the plant and allow the belt to become loaded with aggregate, then stop the plant. Remove and weigh the material from a measured distance on the belt and calculate the pounds of material per foot of belt. This, multiplied by the speed of the belt in feet per minute, gives the pounds per minute of feed. Two determinations will usually yield the information needed to make the initial setting on the bin gate.

Flow of aggregates from cold bins can be represented with mathematical



**Figure 1**

Chart showing passage of a 100-lb. "unit" of aggregate through plant. Mix design calls for 42% coarse stone, 38% crusher run, and 20% sand.



necity by an equation. It would appear that a few simple tests, combined with this equation, would afford a rational and sure way to set the openings. In practice it just doesn't work out. Intelligent trial and error, or actual tests such as the one just described, yield the best results. Under any circumstances, the initial settings must be considered as tentative because they usually need changing later.

To exemplify the procedure, assume that we are to produce the mix in Table 1 at 120 tons per hour. Set down the pertinent figures.

**Table 2**

Production—120 Tons/hr.  
Aggregate Composition

Coarse Stone	42%
Crusher Run Limestone	38%
Sand	20%

Mix Composition

Aggregate	95.0%
Asphalt	5.0%

The total aggregate flow is to be  
.95 × 120 = 114 Tons/hr.

On the basis of the contractor's foreman's previous experience with the crusher run material, he advises you that the crusher run material bin will feed about right at 6 inches opening. On this basis the total openings on an area percentage basis should be 6/0.38 or 16 inches in round figures. We are assuming that our bins are all the same width, so that the relative areas of the bin openings are in direct ratio to the gate openings. The initial bin openings are then calculated.

**Table 3**

Bin A. Coarse Stone:	$0.42 \times 16 = 6.8$ or 6 3/4 in.
Bin B. Crusher run: (From above) 6 in.	
Bin C. Sand:	$0.20 \times 16 = 3.2$ plus 10% = 3.5 or 3 1/2 in.

Set the cold bin gates at these openings.

### SAMPLING AND TESTING THE HOT BINS

Start the plant and allow it to run until you are sure that the feed from the dust collector has had time to

work itself to the hot bins. Dump the partially filled bins and allow them to fill up again, at least halfway.

If the sampling facilities provided in the plant allow it, the samples from each hot bin should be taken while the plant is running. Samples should be not less than 20 pounds and preferably 40 pounds. It requires considerable care to obtain good samples from a hot bin and no pains should be spared in quartering or splitting the sample down to the appropriate weight for the screen analysis.

### MATHEMATICAL COMBINATION OF HOT BINS

Run a screen analysis on a sample from each bin and record the results as shown in Table 4, Columns 1, 3 and 5. It will be observed that the job formula, Column 8, has been rounded off to even percentages.

Observe from the gradings that Bin A is essentially plus 1/2 in. material. Bin B is essentially 1/2"-10 material,

**Table No. 4—Hot Bin Combination**

(a) Represented as Total % Passing	Bin A			Hot Bin Analysis Bin B		Bin C		Combined Grading Total %	Job Formula	Job Limits	Spec. Limits
	% Passing	Total %	28%	Total %	34%	Total %	38%				
	Column No.	1	2	3	4	5	6	7	8	9	10
1½"		100.00	28.0	100.0	34.0	100.0	38.0	100.0	100.0	100.0	100.0
1"		98.0	27.4	100.0	34.0	100.0	38.0	99.4	99.0	90-100	90-100
¾"		8.5	2.4	94.5	32.1	100.0	38.0	72.5	72.0	67-77	65-80
4		3.5	1.0	32.5	11.1	100.0	38.0	50.1	48.0	43-53	40-55
10		0.9	0.3	8.5	2.9	92.0	35.0	38.2	38.0	34-42	30-45
40		0.4	0.1	4.0	1.4	57.2	21.8	23.3	24.0	21-27	20-30
80		0.2		2.2	0.7	27.0	10.3	11.0	12.0	19-29	10-20
200		0.1		1.0	0.3	11.0	4.2	4.5	5.0	3-7	3-7
Asphalt Content									5.0	4.7-5.3	4.5-6.5
(b) Represented as Individual Screen Fractions	% Passing-Ret'd										
	1½"-1	2.0	0.6	0.0	0.0	0.0	0.0	0.6	1.0	0-10	0-10
	1-½"	89.5	25.0	5.5	1.9	0.0	0.0	26.9	27.0	22-32	10-35
	½"-4	5.0	1.4	62.0	21.0	0.0	0.0	22.4	24.0	19-29	15-35
	4-10	2.6	0.7	24.0	8.2	8.0	3.0	11.9	10.0	6-14	5-15
	Total % Passing 10 mesh sieve							38.2	38.0		30-45
(b) Represented as Individual Screen Fractions	10-40	0.5	0.2	4.5	1.5	34.8	13.2	14.9	14.0	11-17	5-20
	40-80	0.2	0.1	1.8	0.7	30.2	11.5	12.3	12.0	9-15	5-15
	80-200	0.1		1.2	0.4	16.0	6.1	6.5	7.0	5-15	5-15
	Passing 200	0.1		1.0	0.3	11.0	4.2	4.5	5.0	3-7	3-7
	Asphalt Content								5.0	4.7-5.3	4.5-6.5

and Bin C is essentially Minus 10 material. The job formula indicates that

Approximate Plus ½" material needed is 100-72 or 28% (Job Formula calls for 28% plus ½" material)

Approximate ½"-10 material needed is 72-38 or 34% (Job Formula calls for 72% passing ½" and 38% passing No. 10 sieve)

Approximate Minus 10 material needed is 38%

Combining the bins mathematically in this proportion, we obtain the grading shown in Table 4, Column 7. This simple method of obtaining the bin proportions from the job formula does not always yield an acceptable grading. Several trials are sometimes necessary to obtain the best combination of the bins.

The combined grading we have obtained is fairly well inside the job limits all the way down. Even if the best combination obtainable were borderline on some of the screens, it would be advisable to run a trial mix and get an extraction before making any change in the plant.

### SETTING THE PLANT FOR MIX QUANTITIES

At this point the procedure differs, depending on whether a batch or continuous plant is used. However, the continuous plant may be thought of as a batch plant. A "batch" is one revolution of the counter. This concept will be employed here.

### Example Employing Batch Plant

The following data will apply:

**Table 5**

Size of batch—4,000 lbs.

Mix Composition

Total Aggregate	95.0%
Asphalt Cement	5.0%

Hot Bin Proportions

Bin A	28%
Bin B	34%
Bin C	38%
Total asphalt in batch = .5 × 4000 = 200 lb.	
Total aggregate = 4000 — 200 = 3800 lb.	

Now calculate the batch weights as given in Table 6.

**Table 6**

Weights

Bin	Per Cent of Aggregate	Lbs. Each Bin	Lbs. on Scale
A	28	1064	1064
B	34	1292	2356
C	38	1444	3800
Asphalt			200

The bins must be set up in the table in the order in which they are added because the actual scale weights for the aggregate are cumulative. The asphalt is weighed on separate scales.

### Example Employing Continuous Plant

The mechanical details of calibrating and making the settings on a continuous plant are well covered in the manufacturer's literature and will not be repeated here. Only the over-all principle will be reviewed.

The aggregates and asphalt flow into the pugmill continuously, each in

its correct proportion. The aggregate belt feeders and the asphalt pump are all geared together so that the rate of pump displacement is in constant ratio to the speed of the aggregate feeder belts. Thus, as long as the feeders work consistently and the pump works efficiently, the total aggregate and the asphalt are added in a constant ratio.

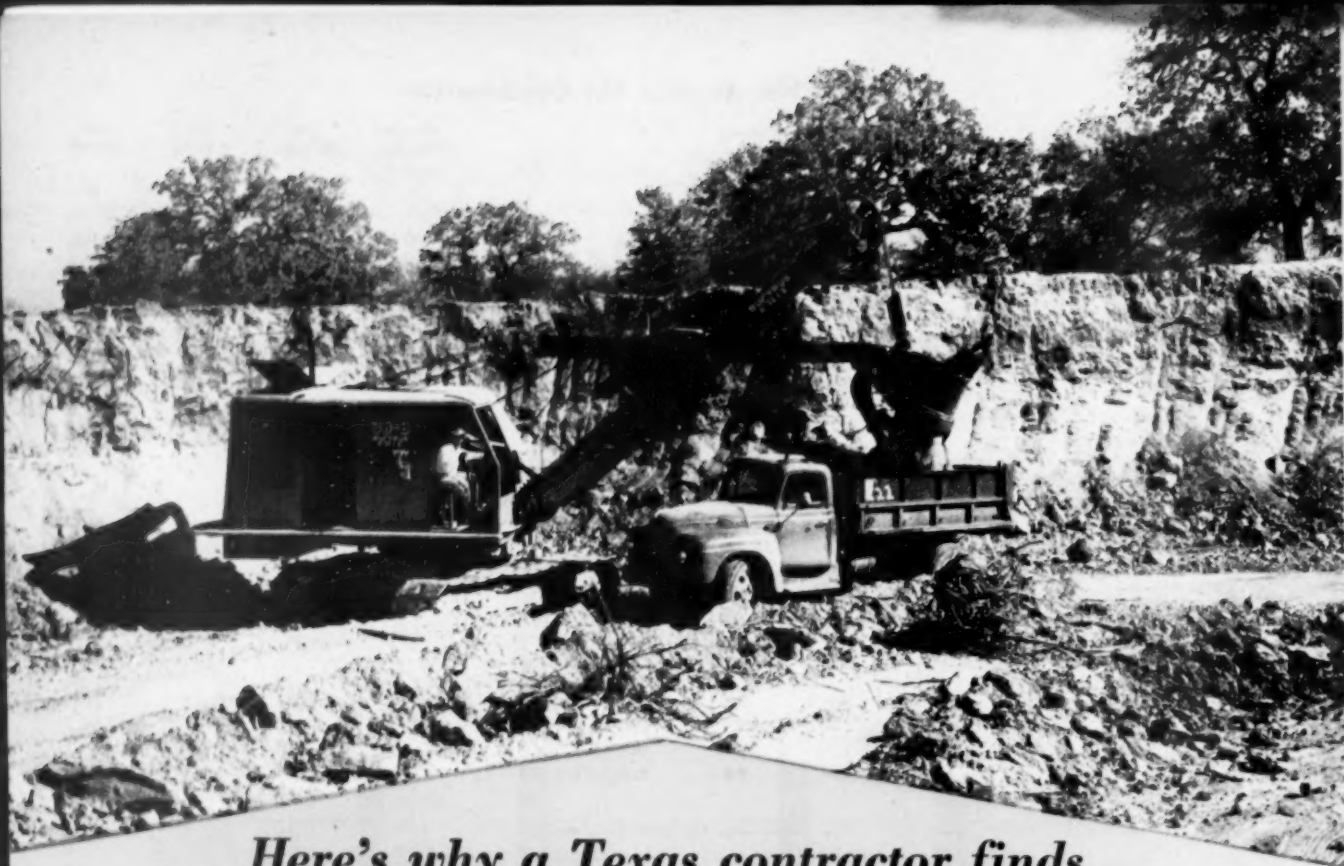
The rate of delivery of the pump may be changed at will, by changing the gears on it. For any desired rate of asphalt delivery, there is a gear combination which will approximate it very closely. The rate of delivery for this particular gear combination is the starting point for calculating the mix quantities.

Having calibrated the aggregate flow in pounds per revolution of the counter against the gate opening for each hot bin, we obtain the following information from the manufacturer's manual.

1. The weight per gallon of asphalt at the temperature it is added.
2. A table showing the gallons per minute of asphalt delivered for each of a number of gear combinations.
3. Speed of revolution counter in revolutions per minute.

We want to produce 120 tons of mix per hour which consists of 6 tons of asphalt (5%) and 114 tons of aggregate. Assume that the gallon weight of the asphalt is 7.8 lb./gal. at the temperature at which it is added.

(Continued on page 119)



## Here's why a Texas contractor finds **IT PAYS TO BE ALL-CAT\***

E. E. Hood and Sons of San Antonio, Texas, are 100% Caterpillar-equipped. Ranney V. Hood, co-owner of the firm, tells why:

*"We feel that Caterpillar equipment is the best made.*

*"We can move half again as much material in the same amount of time.*

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The Cat-powered Bucyrus-Erie 1½-yard shovel shown here makes a swing in less than 15 seconds, loads a five-yard truck in 54 seconds. That's fast, cost-cutting production! The firm is reconstructing farm-to-market highway No. 346, south of San Antonio.

In addition to the Caterpillar D13000 in the shovel, Hood and Sons own two D13000s in a crusher, four Cat No. 12 Motor Graders, seven Caterpillar track-type Tractors, and two Cat rubber-tired Tractors with Scrapers.

Mr. Hood especially likes the dependability and low operating costs of Caterpillar products. The D13000 in the shovel has cut production costs through nearly 8000 hours of pamper-free operation. And, like all Caterpillar Diesels, it can deliver full power, and idle without fouling, on low-cost No. 2 furnace oil.

Experienced contractors like Mr. Hood find valuable "pluses" in standardizing on Caterpillar products: increased operator familiarity, ease of maintenance, simplified parts inventory. There are 12 Caterpillar Engines and Electric Sets, to 500 HP and 315 KW. Your Caterpillar Dealer—who furnishes fast, skilled service and genuine factory parts—will help you pick the unit that's just right for your needs. When you repower, or order new equipment, be sure to specify Caterpillar power. Leading manufacturers of excavators, compressors and other construction machinery can furnish Cat Engines in their equipment.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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## VIEWS AND COMMENTS

By H. G. Nevitt

### Dryers

**I**N every discussion of hot mix paving plants, the subject of principal interest seems to be the dryer and its capacity. The developments which have led to this seem destined to continue. Since knowledge of dryers and their place in the asphalt plant operation will be increasingly important to both the manufacturer of such plants, the contractor using them, and the inspector controlling them, some general remarks on the subject may be of interest.

It is perhaps not generally realized that from the functional standpoint there are two principal parts to an asphalt plant. One is the mechanical mixing operation and equipment to obtain it; the other, the drying of the aggregate and the machine to do it. In the early days, when only rather good aggregates were used, the demands on the dryer under even the worst conditions of operation were usually not great, and the manufacturer could easily supply a satisfactory drying unit at a reasonable proportion of the total plant cost.

#### Correct Moisture Specification

However, two changing situations have greatly altered this picture. One is the use of aggregates requiring either greater drying capacity or different drying conditions. A phase of this is the matter of correct moisture specifications for such aggregates, a subject touched upon previously in this column and which is deserving of more attention. The other—and the one most noticeably leading to dryer trouble—is the rapid increase in plant capacity due to improvements in handling and mixing. Since this equipment was the bottleneck, particularly the mixer in a batch plant, both contractors and manufacturers have successfully worked to improve it so that plant outputs are increasing at an astonishing rate. This has of course tended to bring about other bottlenecks in the mechanical plant; but

these have been corrected with little trouble and expense, until we have reached the point where the dryer capacity instead of being a minor factor is now tending to set the output of the entire plant.

We believe this trend will continue and the problem will become even more serious. Some readers are aware of our past studies to determine the proper mix temperature. In this work it was soon realized that the usual concept that the mixing operation was dependent upon reduced binder viscosity, gained by increasing the asphalt temperature, was only partially correct. It appeared that when the viscosity had been lowered to around 150 S.S.F., the rate of mixing was not being greatly helped by further thinning out; it was instead becoming primarily dependent upon the mechanical mixing conditions and the tendency of the asphalt to wet the aggregate. By the time 75 S.S.F. had been reached, further benefits from thinning out were practically nil, while oxidation tendencies and other evils were becoming serious.

These findings lead to two conclusions. One is that excessive demands on the dryer to provide temperature may not be justified if the moisture control achieved is satisfactory. The other is that great possibilities exist in still further increasing the mixing capacity by recognition of the above situation. One approach might be the use of additives which improve the wetting effect; another would be improvement in the mechanical mixing conditions, and likewise perhaps the adoption of mixing cycles which are sufficient to do the work yet do not call for longer time than is really required.

Manufacturers are presumably giving the mixing conditions careful attention; however, whether or not mixing cycles today reflect the exact needs in each case is a matter of some doubt. We are not conversant with

any studies on this point; we can only suspect that in many cases it will be found that the mixing cycle can be satisfactorily cut down without damage—or perhaps even gain due to decreased oxidation. Even if such developments do not lead to increased mixing speed we think it quite safe to predict that the plant capacity possible from the mechanical equipment will continue to steadily increase, and therefore the dryer problem will become increasingly acute.

#### Multiple Drier Units

We do not believe that the solution is necessarily to blindly increase the dryer capacity; we think that further study of the drying operation, understanding of its need on each project, and the application of this knowledge will, in the majority of cases, give a much more economical solution by the use of present equipment. Yet we also face the need for more dryer capacity in some instances.

Some contractors have solved dryer difficulties by utilizing two dryers in series. We think the basic thought behind such an approach has great merit. In other words, it is quite possible that instead of building plants with increasingly larger dryers, units of dryer capacity should be built and one, two, or even three such units utilized for any particular condition as analysis indicates desirable. Since two separate capacities are involved in an asphalt plant there seems little reason to try to tie the two together. Instead the practice might wisely be to build a plant of the desired mechanical capacity and then service it with the dryer capacity that is needed by the specific conditions, selected in the same general fashion as are the trucks and other individual pieces of auxiliary equipment.

The approach which may offer benefits from present equipment is that of greater flexibility in the operation of the dryer. Essentially the re-

sults from any dryer are dependent upon its Btu input and its residence time. The latter usually is set by the manufacturer to agree with the former for ordinary aggregates. However, certain types of aggregates could probably be dried more satisfactorily by changing the residence time. In other words, the two functional requirements are not necessarily geared together, and the contractor might in some cases get the drying job done by simply changing the operating characteristics of his particular unit, since there is presumably some range of flexibility of which he can take advantage. Manufacturers and some contractors are aware of this course of action and are perhaps following it; but in many of the discussions of dryers to which we have listened, the possibility that this procedure might correct the trouble had not apparently been given thought.

### Consider Specific Problem

Our remarks might be summed up by the statement that the point is being reached where the dryer must be installed and operated as an individual unit to perform a specific duty on each assignment, rather than as merely part of the plant, with its capacity geared to that of the plant regardless of the location or problems in use. Drying is a well-known unit process in the chemical industry, recognized as having its individual problems and susceptible to rational design and operation on the basis of them. It is even possible that modern drying equipment is not always the best for certain types of work and that a new type dryer will prove to be suitable. In brief, it would appear that we need to go back to fundamentals on drying; and that through the application of normal and rational engineering, we might prevent the dryer from being the limiting factor in the remarkable improvement in plant mixing capacities and costs which has become so noticeable.

### Asphalt Institute appoints three district engineers

Bernard E. Gray, President of the Asphalt Institute, has announced the appointment of Frank H. Gardner, Dillard D. Woodson and Robert B. McKeagney to district engineering posts in the eastern half of the United States.

Frank H. Gardner's territory covers New York State outside of New York City and Long Island. His headquarters will be at 45 North Lake Ave., Albany, N. Y.



● Frank H. Gardner

Mr. Gardner comes to the Institute equipped with long and varied experience in highway, airfield and maintenance work. His memberships include the Highway Research Board, the Association of Asphalt Paving Technologists, the American Society of Civil Engineers and the American Association for the Advancement of Science.

Dillard D. Woodson's territory includes the states of Alabama, Florida, Georgia, South Carolina, and Tennessee. His headquarters will be in the Mortgage Guarantee Building in Atlanta.

Mr. Woodson's engineering career includes long experience in highway building and maintenance, and service on air base work during World War II.

Mr. Woodson holds membership in the American Society for Testing Materials and the Highway Research Board.

Robert B. McKeagney has been appointed to the New England area with offices at 585 Boylston Street, Boston, Mass. In this area he succeeds Edward M. Howard, whose new territory includes the states of Arkansas, Illinois, Missouri, and Wisconsin, with headquarters in the Leland Building in Springfield, Illinois.



● Dillard D. Woodson

### Bituminous fellowship

The School of Civil Engineering of Cornell University has announced the establishment of a 2-year fellowship for graduate study in the use of bituminous materials and aggregates for bituminous paving mixtures. This fellowship is supported by the New York State Bituminous Concrete Producers Association.

The announcement noted that opportunities for study and research in the bituminous paving field at Cornell are enhanced by the availability of a small but well-equipped bituminous laboratory and excellent library facilities.

Information about the fellowship may be obtained from Professor Taylor D. Lewis, Lincoln Hall, Cornell University.

### Important Correction

Editor's Note: Those who read the valuable article, "Graphical Method for Combining Aggregates," by J. Rogers Martin, in *Roads and Streets*, March, 1954, may have failed to understand a certain part of the text. The reason was the transposition of several lines of type.

If you have saved this article, and intend to refer to it or use it in your work, please turn to page 107, and note the following *correct* wording beginning with type line 7, column 2, and extending through line 19 in the next column:

... First mark reference ordinates on each chart as indicated in Figures 2-A, 2-B, and 2-C, corresponding to each tentative percentage.

### The Combined Grading

The combined grading for the No. 40 screen is now obtained as follows.

Using Figure 2-A, place 0 of the scale on the No. 40 line, with the scale coincident with the 70% reference line and observe the reading at its intersection with the horizontal axis, which happens to be about 16.0. Now line the scale up with the reference line (13%) on Figure 2-B, with the last observed reading on the No. 40 line and observe the reading of the scale at the horizontal axis, which is about 19.4. Now line the scale up with the 17% reference ordinate on Figure 2-C and place the 19.4 last obtained on the No. 40 line ...

● Charles Weller, executive assistant to the commissioner and to the chief engineer of the Massachusetts Department of Public Works, has retired after 31 years of service with the state.

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L. J. Domppe hand-sprays corner of road being oiled.



## Operates four Etnyres—2 to 29 years young!

One-man operation . . . nozzles that stay freer . . . and a good pump near the job . . . are three main reasons why "Etnyres are the best we ever had" in the opinion of Marvin F. Borgelt, Treasurer, Bituminous Surface Treating Co. of Minneapolis, Minnesota.

Four Etnyres are in the fleet, ranging in age from two to twenty-nine years. On the unit shown above, no maintenance due to failure of the unit has been necessary. Air controls in the cab make possible one-man operation.

Mr. Borgelt points out that Etnyre has a de-

pendable pump located under the tank, forcing material under constant pressure to the spray bar with an even, nonpulsating flow. Among other features, he points to easy loading, simplified draining, easy-to-start engines, efficient handling of all types of materials, good performance on any type of terrain, plus prompt service when needed from the Etnyre factory organization.

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## Pitfalls and Pointers

(Continued from page 113)

$$\begin{array}{r} \text{gal.} \\ \text{min.} \end{array} \frac{6 \times 2000}{60 \times 7.8} = 25.7 \frac{\text{gal.}}{\text{min.}}$$

From the table in the manufacturer's manual, we find a gear combination which will deliver 25.2 gallons per minute and these gears are placed on the pump. Thus we will produce slightly less than 120 tons/hour and will reduce our aggregate flow from 25.2

$$114 \text{ tons/hour to } \frac{25.7}{25.2} \times 114 = 112$$

Tons per hour = 3,730 lb. per minute. If the revolution counter is found to turn at 15.28 rpm., the amount fed for each revolution is  $\frac{3,730}{15.28} = 244 \text{ lb.}$

Consider 244 lb. as one batch of aggregate and calculate the pounds of each aggregate required. From the calibration curve for each bin, determine its setting in inches to deliver the calculated amount. In practice, four hot bins would probably be used for our mix because the fine material is usually split and fed from two bins.

### TRIAL MIX

Start up the plant; dump a few hundred pounds from each bin, and then make up a trial mix. Sample and test the mix carefully.

The greatest single source of error in testing asphalt mixes is in the sampling. This is particularly true in mixes having a top size of  $\frac{3}{4}$  in. or more. The difficulty increases as the top size of aggregate increases. The major problem lies in the fact that the commonly used asphalt extractors will handle only about 1,500 grams, and one single rock passing the 1 in. and retained on the  $\frac{3}{4}$  in. screen, may weigh 50 grams or more. 50 grams is 3.3% of 1,500 grams. Thus, with the same batch of material, the absence of one rock would change the analysis over 3% on one screen. Two rocks difference could throw the analysis completely out of the job limits on a perfect mix. The potential error from this cause increases geometrically as the size of rock increases. For instance, the weight of a  $1\frac{1}{2}$  in. rock may be more than three times that of a 1 in. rock.

Possibly the most dependable means for sampling a continuous plant is to pass a container horizontally across the flow of mix from the delivery gates, repeating it several times to collect a 20 to 40 lb. sample.

Good samples may be obtained from a batch plant by taking the material from a truck as follows:

Working in one corner of the truck and at a point where the angle of repose is neither flat nor steep, shave off the top surface with a square-

Table No. 7—Extraction Results

Passing Column No.	Job Limits 1	Job Formula 2	Theoretical Hot Bin Combination 3	Trial Mix Extraction 4	First Production Extraction 5	Second Production Extraction 6	Third Production Extraction 7
1 $\frac{1}{2}$ "	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1"	90-100	99.0	99.4	100.0	100.0	100.0	100.0
$\frac{3}{4}$ "	67-77	72.0	72.5	71.2	72.4	72.3	71.8
4	43-53	48.0	50.1	51.5	51.0	49.8	48.3
10	34-42	38.0	38.2	37.2	38.4	38.2	38.7
40	21-27	24.0	23.3	25.0	24.5	24.0	23.6
80	10-20	12.0	11.0	12.3	13.0	13.1	11.8
200	3-7	5.0	4.5	6.0	6.3	6.3	5.2
Asphalt Content	4.7-5.3	5.0	—	5.15	5.19	*5.06	*4.97

% Passing-Ret'd	1 $\frac{1}{2}$ -1	1 - $\frac{1}{2}$	$\frac{3}{4}$ - 4	4 - 10	Total % Passing 10 mesh sieve	10-40	40-80	80-200	Passing 200	Asphalt Content
0-10	1.0	0.6	—	—	—	—	—	—	—	—
22-32	27.0	26.9	28.8	27.6	27.7	28.2	23.5	9.6	15.1	11.8
19-29	24.0	22.4	19.7	12.6	11.6	9.6	6.6	5.2	4.97	5.06
6-14	10.0	11.9	14.3	12.2	13.9	14.2	15.1	11.8	9.6	6.6
11-17	14.0	12.2	12.7	11.5	10.9	6.8	6.3	5.2	4.97	5.06
9-15	12.0	12.3	12.7	11.5	10.9	6.8	6.3	5.2	4.97	5.06
5-15	7.0	6.5	6.3	6.7	6.8	6.3	5.2	4.97	5.06	5.06
3-7	5.0	4.5	6.0	6.3	6.3	5.2	4.97	5.06	5.06	5.06
4.7-5.3	5.0	—	5.15	5.19	*5.06	*4.97	5.06	5.06	5.06	5.06

(b) \*After 0.11% Ash Correction.

ended shovel, forming a cut face which will "hold." If material tends to "slough down" from the face, it is cut at too steep an angle. Take the sample by placing the shovel at the lower part of the cut face and working it upward in such a manner that all of the material cut out of the face remains in the shovel. Large rocks tend to roll off of the shovel, so it is advisable to take fairly small shovelfuls. Repeat this procedure at the other three corners of the truck, gathering a composite sample of 20 to 40 lb.

### REMARKS ON EXTRACTION

A cardinal sin in the control of mixes, and one which causes frequent trouble, is too much "short-cutting" in the extraction test. Frequent sources of error are:

#### (1) Preparation of the sample for extraction.

The sample should be quartered on a board or piece of metal which is clean, so that it will not collect the fines from the mix. Fines collecting on the cutter should be scraped off after each quartering and distributed between the divided portions of the sample.

#### (2) Defective Equipment.

An extractor which does not afford a flush fit between the bowl and top is next to useless. It pays to check this occasionally.

#### (3) Ash Determination.

Ash determinations are troublesome and time consuming to run, but it is essential that one be run occasionally. Various methods are used for estimating ash, the best one being that in which the ash is assumed to be a certain percentage of the minus 200 material. However, this percentage should be based on a given extractor and a given mix. This necessitates running an ash on the very first mix. It is usually not necessary to hold up starting the plant pending the completion of the determination. When, during the course of a paving project, the asphalt content by extraction consistently shows higher or lower than the calculated quantity being added, one can suspect that the ash assumption is erroneous.

#### (4) Incomplete Drying.

The sample should be dried until there is no odor of solvent.

Most of the troubles which accrue from the extraction test are caused by faulty testing technique. In the hands of a skillful operator, it yields good results.

### EXTRACTION ANALYSIS

Let us assume that we have completed the trial-mix extraction and obtained the results in Table 7, Column 4. The results check the theoretical combination from the hot bins fairly well. It is observed that the

Table 8

Material	Initial Setting	Indicated Change	New Settings
Coarse Stone	6¾	$\frac{6}{.88} = 7.7 \text{ or } 7\frac{3}{4}"$	7¾"
Crusher Run	6	Minus ½"	5½"
Sand	3½	Minus ½"	3.0"

No. 4 screen is somewhat on the fine side, with the result that the ½-4 and 4-10 fractions are out of balance. However, it is not advisable to make any change at this time. Under the very best control conditions the analysis nearly always changes slightly from that of the trial mix after the plant is put into continuous production. Also, it will usually settle down to a fairly constant gradation after a few hundred tons have been produced.

The asphalt content is toward the high side of the job limits but the ash determination has not been completed, which will reduce it slightly, possibly 0.05 to 0.15%.

On the basis of the grading and asphalt content of the trial mix, the contractor is allowed to start paving operations.

#### FINAL ADJUSTMENTS

Allow the plant to get into swing by producing 20 or 30 tons, before taking another sample for extraction. Beginning with the first production sample, extraction tests should be made in a steady sequence. As soon as one is completed another one should be started. After the plant is in final adjustment, one or two a day are sufficient. The analysis of the first production sample, Table 7, Column 5, gives a good check on the trial-mix extraction, giving us confidence that we are fairly close on our hot bin proportions.

After the plant has been in production for a few minutes, we will usually discover an "unbalance" in the hot bins. One or more may be overflowing while one or more of the others will run shy of material periodically. If the extraction analysis is inside specifications (which means that we are using about the right proportions

from the hot bins) we know at once that some of our cold-bin gate settings are incorrect.

For our mix, assume that the fine and intermediate bins (B and C) are overflowing, while the coarse bin (A) is running shy. What changes should we make?

By observing over a period of ten or fifteen minutes, about how much time is lost waiting for the shy bin to replenish itself, we may arrive at an approximation of how much the feed should be increased. Let us say that such an observation indicates that we are waiting for material 12% of the time. In other words, we are only getting 88% of the flow we need into this bin. This bin is essentially plus ½ in. material and our aggregate analysis in Table 1 shows us that practically all of this size is furnished by the coarse stone cold-feed. The setting on this feed is now 6.75 in. which is 88% of what is needed. We will, therefore,

increase this feed to  $\frac{6.75}{.88}$  or 7.7 in., say 7¾ in.

If we are to keep the total feed constant, we must make a decrease in one or more of the other bins. In this case where two bins are overflowing, we would probably reduce the feed of the two bins equally. We have increased the opening in Bin A by 1 in., so we will decrease the opening in Bins B and C by ½ in. each. Table 8 shows the initial openings and the changes made.

Having made the alterations in the cold-bin openings, and after the plant has run for awhile, we find ourselves waiting occasionally on the fine bin to replenish itself. The other two bins are overflowing slightly.

Table 9

% Passing Column Nos.	Specifications 1	Job Limits 2	Extraction 3	Corrected Extraction 4
1½"	100.0	100.0	100.0	100.0
1"	90-100	90-100	87.6	100.0
¾"	65-80	67-77	63.5	72.5
4	40-55	43-53	42.0	48.0
10	30-45	34-42	33.3	38.0
40	20-30	21-27	21.5	24.6
80	10-20	10-20	9.8	11.2
200	3-7	3-7	4.6	5.3
Asphalt Content	4.5-6.5	4.7-5.3	4.50	5.13*

\*Approximate.

In view of the fact that we are not getting enough minus 10 material, we know that either the sand or crusher run, or both, must be changed. A good clue as to what change should be made can frequently be found from the grading analysis from the extraction. Assume that we have completed an extraction subsequent to making the changes in the cold bins. It is shown in Table 7, Column 6.

The minus 200 is higher than our job formula. This suggests the possibility that we may be feeding too much crusher run material, which is high in minus 200. The analysis is in the job limits, but the No. 4 screen is a little high even though the screen below it is about right. This means that we are getting more No. 4 to No. 10 material than the job formula calls for. Looking back at the analysis of the cold materials, we see that nearly all of the No. 4-10 material is furnished by the crusher run material. This strengthens the suspicion that we are adding too much crusher run material.

All of this gives us a definite indication that the sand should be increased and the crusher run material decreased. If the sand is increased by the same amount that the crusher run is decreased, we will get an increase in the minus 10 material, in addition to adjusting the wayward screens. This is because the sand is nearly all minus 10, whereas only 48% of the crusher run material is minus 10.

When we know *qualitatively* what change to make with nothing quantitative to guide us, the changes should be made in small increments, never over 5% of the total aggregate. We are trying to feed around 20% sand, indicating that the maximum change should be 5/20 or 25%. On this basis, we increase the sand feed by  $3.0 \times .25$  or 0.75 in., to make a total opening of 3¾ in. The crushed run opening is decreased by the same amount. We now have the following settings:

Material	Final Settings
Coarse Stone	7¾ in.
Crusher Run	4¾ in.
Sand	3¾ in.

To our complete pleasure, we now find that the overflow is negligible and the plant is in good balance. Also, the No. 4 screen edges in toward the center of the job limits on subsequent extractions, typified by Table 7, Column 7.

#### GENERAL REMARKS

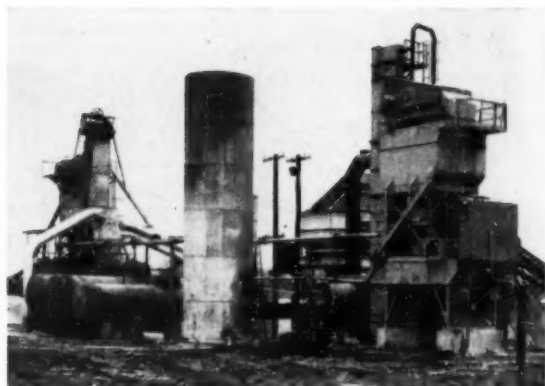
The foregoing illustration was designed to analyze a typical case, in which neither the inspector nor the plant foreman were able to predict the proper cold-bin openings for the plant. An experienced plant foreman—one who has had the wisdom to keep records on his cold feeds on a number of jobs—can usually come very close to the proper settings on the first trial.

(Continued on page 122)



## Another Set of Cummer "Twins"—Companion Asphalt Plants, Both Efficient Producers

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Every Cummer Asphalt Plant is Ruggedly Built to Deliver,  
Year after Year, Dependable, Profitable Production

Today, as they have for almost sixty years, successful contractors are helping fill the tremendous need for new roads, more roads and better roads with efficient, dependable Cummer Asphalt Plants.

Valley Asphalt Co. of Cincinnati, Ohio, purchasers back in 1934 of the 40-50 tons per hour capacity\* Cummer Asphalt Plant pictured on the left, are typical of alert, sound-business paving contractors who can be relied on "to deliver the goods".

When their operation justified an additional asphalt plant in 1953, their choice was a Cummer Plant of 90-100 tons per hour capacity\*, so satisfactory had been the performance of the original Cummer plant . . . year in and year out.

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#### Some of the Fine Features Incorporated in Cummer Asphalt Plants

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(Continued from page 120)

This illustration was simplified to the extent that the job formula was fairly well reproduced by the materials on hand. This is frequently not the case.

When a plant has been brought into good balance, and the best combination from the hot bins deviates appreciably from the job formula, it is an indication that the screen analyses of the cold feed materials were not quite representative. In many such cases the analysis being produced by the balanced plant is satisfactory, staying well within specifications and giving a fairly smooth grading. When this occurs, it is customary to alter the job formula to conform to the materials being used. It should be remembered that a job formula is not necessarily an ideal formula, but merely one that was derived by an analysis of the samples submitted to the laboratory. It is therefore sound engineering to consider the laboratory job formula as tentative and adopt a new job formula if necessary after 1,000 tons or so have been run through the plant.

The difficulties in obtaining a good grading from extraction, of a large top size mix, has previously been mentioned. It has been the writer's experience that the results of the grading values for the No. 10 and smaller screens, runs fairly consistent with the actual composition of the mix. As a matter of fact, the grading from the extraction is more accurate for the smaller screens than the theoretical hot bin combinations, because the dry samples from the fine bin frequently show less material passing the 80 and 200 mesh sieve than is actually present. The analysis from the larger hot bins is very dependable, provided the samples are taken and quartered carefully. The writer places more credence on the theoretical hot bin combinations for the  $\frac{1}{2}$  in. and larger screens than he does on that obtained from the extraction. On the other hand, more credence is placed on the extraction results for the No. 10 and smaller screens.

By way of illustration, consider the analysis in Table 9, Column 3, which one would get sooner or later on the mix in our illustration.

"Ye Gods!" says the inspector, "the mix has gone completely out of specifications limits in two places and is out of the job limits on nearly every screen. And look at the asphalt content!"

Be calm. Nothing has happened, except that two nice long  $1\frac{1}{2}$  in. rocks found their way into the extraction sample where there had been none before. By multiplying each screen quantity by 100/87.6, or 1.14, we obtain the composition of the mix which passes the 1 in. screen. It is listed to the right of the actual analysis and is the familiar grading we have been getting all along.

When a mix has been testing satisfactorily and suddenly one of the larger screens shows an appreciable deviation, either high or low—and the screens below it show a deviation in the same direction—a calculation, such as the one just given, will often reveal that the composition of the mix below this screen is okay. This is a dead give-away that a disproportionate amount of the larger rocks got into, or was omitted, from the sample. The correction factor to use in such a case is as follows: Determine the average analysis which has been previously obtained on the vagrant screen or determine the quantity for this screen from the theoretical hot bin combinations. Divide this figure by that actually obtained from the screen in question to obtain the correction factor. Multiply it and each of the smaller screens by this factor to derive the corrected composition of the material. When the passing-retained system of showing screen analysis is employed, the only value which would be greatly affected in the screen analysis for such a case would be the fraction passing the  $1\frac{1}{2}$  in. and retained on the 1 in. However, the asphalt content will show a low value.

#### IN CONCLUSION

If a hot mix plant is in good mechanical condition, whether it be the continuous or batch type, then the success in producing a good mix rests largely with the human element involved. The aggregates to be used must be carefully sampled and tested by the designers. The contractor must use cooperation in stockpiling and handling his materials to prevent segregation. The plant foreman must see that his men perform their duties carefully on every count. The plant inspector must be well qualified and have a clear understanding of the overall operation. He must understand the sources of error in testing and guard against them religiously. He must also understand the complexity of the problem facing the contractor in getting a job under way. The resident engineer should realize that bringing a mix into production is no job for a novice. If his inspector is not well qualified, he should supervise the work closely until the plant is in production.

When each person involved performs his duty conscientiously, there is seldom any difficulty in producing a closely controlled mix.

#### WASHO road test program resumes

The program for concluding field testing at the WASHO Road Test in southeastern Idaho was announced by the Highway Research Board, following a meeting of the road test Advisory Committee. Full-scale traffic over the test sections was sus-

pended from December 11, 1953, to February 17, 1954, during the time when the pavement was frozen.

The Committee decided that maximum useful information within the limits of remaining funds available would be obtained by operating traffic through May and continuing routine observations of deflection under load, deformation, etc., during this period. Traffic will then have been operated during all seasons of the year except the winter months when no effect of load is noted. Following shut down of the regular test traffic several special studies will be made. These will include studies of pavement deflection under various loads, studies of the pavement components, and numerous correlary studies intended to augment the information obtained in the test and simplify the analysis and interpretation of the findings. This phase will take two or three months.

During this period and for several additional months the staff assisted by technical specialists will complete the tabulation and analysis of the data and with the counsel of the Advisory Committee, will determine the significant findings. These, along with all basic data, will be reported by the Highway Research Board in due time.

#### Adams grader movie

A new full-color, sound movie on Adams Motor Graders has just been released. The film, about 20 minutes in length, features the operating advantages of Adams machines and then shows their application by owners on various types of work in various parts of the country.

Among the features highlighted are a wide range of operating speeds, including high transport speed; 4 reverse speeds up to 13 m.p.h. (an exclusive feature); the availability of "creeper" gears in a new Adams constant-mesh transmission for operating speeds as low as  $\frac{1}{4}$  m.p.h.; dual braking system for safe and easy stops; rubber mounting of Adams engines to eliminate vibration at the operators platform; and a foot accelerator for easy, natural driving overland.

Showings of the film may be arranged with local Adams dealers.

New District Manager for Clark. Dudley A. Burnet has been appointed district manager for Construction Machinery Division, Clark Equipment Co., Buchanan, Mich., for the South, Atlantic Coast and New England Districts. Marshall O. Nyström has been appointed district manager for the 11 western states and Oklahoma and Texas.



● Gunite materials being applied to rock facing for slope stabilization project along a San Francisco street widening. (Wide World Photo.)

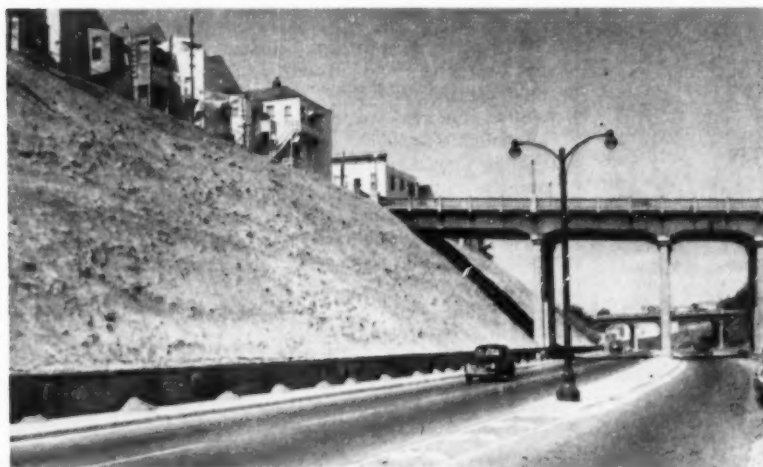
## Shelved Riprap for Steep Slope

ONE of the main features of the recent improvement of San Jose Avenue from Randall Street to Monterey Boulevard, in San Francisco,

was the stabilization of the steep westerly cut-slope which had been subject to numerous small landslides over many years. After installing a

series of tile under-drains, 5,244 tons of quarry-run rock, varying in size from pea gravel to pieces weighing 300 lb., was placed on benches cut in the slope. The rock, lying on a slope of about 1 to 1, acts like an inclined gravity retaining wall. To prevent the percolation of surface water which might lubricate the underlying earth, two inches of gunite mix (cement, sand, water) was blown into place with pneumatic equipment, covering the entire surface of the rock slope. This treatment, which had been found to be quite effective in controlling a previous large slide in the cut, extends for a distance of about 830 ft., along the road, with average height 40 ft., and accounts for about 39 per cent of the contract cost, or \$133,543.10. The contractor was Charles L. Harney, Inc., San Francisco.

The foregoing facts on this interesting and unusual story were supplied by Sherman P. Duckel, Director, Department of Public Works, City of San Francisco.



● The finished slope is safer against slides. Also neat in appearance—an important factor to neighborhood property owners. (Wide World Photo.)



# Symposium on Asphalt Job Control

Notes on a panel discussion on this subject, presented at the Annual Meeting of the Association of Asphalt Paving Technologists, Louisville, Kentucky, February 1-3, 1954.

**T**HE three-day technical session of the Association of Asphalt Paving Technologists, at Louisville, included a symposium on plant and lay-down control in asphaltic concrete surface construction.

Chairman was J. Rogers Martin, chief engineer, Hot-Mix Asphaltic Concrete Association of Oklahoma, Inc.

Panel members included Moray MacNaughton, vice-president, Milton Hersey Company, Ltd., Montreal; E. O. Sellers and L. C. Reime, bureau of materials, Illinois division of highways, Springfield; Warren B. Warden, Miller-Warden Associates, consultants, Swarthmore, Pa.; and D. D. Dagler, head research engineer, Pennsylvania department of highways, Harrisburg.

Following are notes on some of the pertinent points brought out by the various panelmen and in discussion from the floor.

Mr. MacNaughton, who heads a commercial testing laboratory, told of the special problems in Canada due to the shortness of the season. Inspection is problem due partly to the custom of providing only seasonal employment to inspectors, who drift elsewhere during the winter. Engineering students have filled in during the summer vacation months with fair success, the best results coming from men who return a second and third summer. Because of the average low grade of personnel on inspection, it is important to draw up specifications in such a manner that the fieldmen can determine readily whether the contractor is complying.

## Canadian Problems

Mr. MacNaughton noted that Canadian provinces have generally up-to-date specifications, but that the local and municipal bodies are far behind, with very obsolete specifications, some dating actually from 1900. His company has had to refuse tendering bids for inspection service to such bodies. In many cases the most serious aspect of such specifications is the lack of "teeth"—they are vague and unenforceable.

In Canada as in the United States, specifications need to be skillfully written to permit use of economic yet suitable aggregates. Some roadbuilding work can utilize plentiful local materials; elsewhere there may be a 500-mile haul. Differentiation between base and surface aggregates is important, since some local materials with a high Los Angeles rattler loss may make a good base.

This speaker made a plea for more complete survey data on aggregate locations, to be made available to contractors. In Canada there is need to adopt the standard U. S. screen scale for dividing aggregates. Various agencies

in Canada are also working toward the control of paving mixtures to closer tolerances, and urging the use of modern asphalt plants which divide the aggregate into separate sizes and feed from the hot bins in accurate proportions. An important need at the plant is to provide better control of dust, to protect the operator, by means of vacuum or suction devices.

The second panelman, Mr. Sellers, reviewed the Illinois program of arterial pavement resurfacing with asphaltic concrete. Begun in 1942 on the state's old concrete, this work included 57 miles the first year and has since stretched into 3,000 miles or more.

## Illinois Reinforcing Problems

The state tries to have on each job at least four graduate engineers or men with equivalent experience as asphalt inspectors—one at the finisher, two at the plant (of which one has had previous proportioning experience), and one trainee. The state requires the contractor to show that he has the proper equipment before the work begins, and the equipment must pass formal inspection.

Truck bodies used for hauling hot mix in Illinois must be insulated on the outside and lined with metal, and the inside must be sprayed with distillate while bed is raised, before loading.

In gauging truck hauls for spreading, Illinois contractors use various methods to keep the spread accurate. Some keep a check of the lineal feet of yield per load, others use an odometer on the truck, many use a calibrated rod for checking the mat back of the paver and after the first roller pass.

This speaker noted the importance of having paving equipment in good repair and adjustment. Worn bearings

(Continued on page 127)

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**ABOUT GUARANTEES.** Every reputable contractor stands back of his work. If troubles develop he "makes them good" to assure customer satisfaction. This is his best advertisement. He, therefore, by long established practice or written warranty, guarantees his work.

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## Asphalt job control

(Continued from page 124)

in the screed or guide bar of the finisher, for example, can throw the paver "off." Equipment should be thoroughly reconditioned before the season begins.

Illinois inspectors are on guard against over rolling. Rollers cannot exceed 150 ft. of travel per minute.

Samples of the finished pavement taken are preferably sawed out, noted Sellers, although sawing isn't a definite requirement in the specifications.

### Quality Control Set-up

One of the most interesting summaries was that of Warren Warden, the third speaker. Speaking as the head of a commercial testing organization participating in the huge Garden State Parkway project in New Jersey, Warden dealt principally with the administrative aspects of coordinating various group efforts concerned with getting the job done. Warden said that expediency is the curse of turnpike construction, the urgency to get the job done fast being greater as the finish draws near. Many compromises are inevitably made with quality, to meet the opening date. Some compromises represent good engineering; others perhaps not. The big point is that decisions affecting quality should not be made by the same men who are under pressure. Quality should have its spokesman in the administrative set-up.

With nearly 200 contractors and 16 supervisory engineering firms employed currently on the Garden State Parkway, this problem has been recognized as one of extreme importance. The general consultants push the work, the authority oversees quality, and the materials consultant carries out the quality control. In this scheme the materials consultant reports to the field and also directly to the chief engineer of the authority—the first such set-up for a toll road project. This has the advantage of leaving others free to concentrate on getting on with their respective functional assignments.

Flexibility of thinking and action is also a feature of the New Jersey organization. A material supplier may be fundamentally good, but temporarily sending through sub-standard materials. Trouble shooting ferrets out the cause, correction is made, and a valuable supply source thus kept in the running, to the advantage of all.

### Dryer is Bottleneck

Mr. Dagler of Pennsylvania, the fourth panelman, told of his state's current use of over one million tons

annually of hot asphaltic mix—94% of tonnage used today is hot, compared with use largely of cold mixes before the war. He named some of the requirements resulting in good plant control—such as layered placement and removal of stockpiled stone, etc.—and said that a state-wide effort has been made to get contractors to maintain clean, dust free plants.

The dryer is the first bottleneck, said Dagler. The inspectors watch the drying particularly after a rain; the contractor who wants to resume operation the day after a rain cannot al-

ways do so. He probably will want to put on more heat, which might drive the moisture into the aggregate, resulting in a mix that leaks water into the bottom of the truck bed. The most important plant control up to this point is the pyrometer located at the outlet end of each dryer, observed this speaker.

Fuels for spraying the inside of the truck bed, to avoid sticking, are not permitted in Pennsylvania. Truckbed insulation for transporting hot mix is not required except in unusually cool weather.



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Ask your dealer, or write Rosco for the full story of the Bituminous Distributor with "P.M."—the Pressure Metering Method.

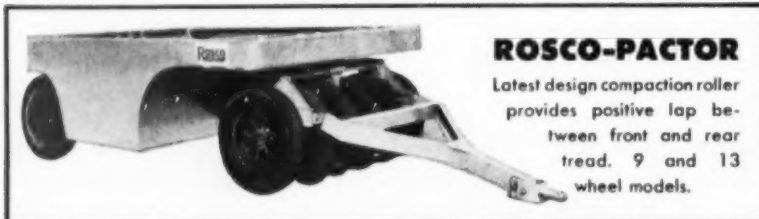
"Early in the summer of 1951 the City Council of Muscatine purchased a Rosco 1000 gallon capacity Distributor and mounted it on a 1½ ton truck. To say that we are well pleased with our Rosco Distributor would be stating it mildly.

"We started our extensive road program last year and our Rosco was in constant use every day it was possible to work. We seal-coated 150 blocks of City Streets and in addition to this, constructed 36 blocks of road mix asphalt, besides oiling nearly 100 blocks of City Streets.

"During all this time we had only one minor breakdown on our Rosco which was taken care of in less than 2 hours time by our own mechanics.

"All of this work was done directly under my supervision and I feel well qualified to praise our Rosco as one of the best pieces of equipment owned by the City of Muscatine and we own nearly \$150,000 worth of street construction equipment of all makes.

"This year we are planning another heavy schedule of street improvements and when we start in a few weeks I entertain no fears as to what our Rosco will and can do for us."



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Plant operators in Pennsylvania have improved their control so well from year to year that the engineers are placing "band within band" in the gradation charts.

In the discussion following these four speakers, many points were brought out. A few:

● The lay-down operation is a neglected phase. In Pennsylvania, plant control is no longer a major problem, but the fine points in finishing and rolling need constant emphasis, said Dagler.

● Someone in discussion said that a "pick handle ought to be mounted on the finisher, for the guy who wants to constantly juggle the screed."

● Attitudes are important in the operation of both batch-type and continuous asphalt plants. If the contractor and inspectors want to make one type or make of plant look good or bad, they can easily do so. Prejudice still rules in plant selection and approval in some areas.

● One manufacturer's representative made a plea for the engineers to get together on the throw of screens.

● Economic considerations as well as quality requirements should be balanced. High production, the goal of contractors, is often hampered by unnecessary restrictions and refinements.

● Better educational methods are needed to produce better inspection personnel in many states. Upgrading of inspector pay would contribute.

● In Pennsylvania the inspection problem has been simplified by turning over the mix design to the contractor and making him responsible for it. "Amazing" results, said Mr. Dagler. A school on bituminous concrete for contractor field personnel is planned in Pennsylvania this spring.

● Dwight R. G. Palmer has been appointed New Jersey state highway commissioner, succeeding Ransford J. Abbott who has been appointed chairman of the New Jersey Garden State Parkway Authority.

Mr. Palmer, who will receive \$18,000 annually, is president of General Cable Corporation and a former treasurer of the Democratic National Committee.

● Harry E. Neal of the Ohio department of highways and head of the department's traffic bureau, died recently at age 70.

NEW WOOLRIDGE DISTRIBUTOR. Shriver Machinery Co., 1756 Grand Ave., Phoenix, Ariz., has been appointed exclusive distributor by Woolridge Mfr. Co., Sunnyvale, Calif., for the state of Arizona with exception of Yuma County.

## Direct density test for bituminous mixtures

By James M. Rice. *Crushed Stone Journal*, Vol. 28, No. 3, pp. 10-17, September, 1953. *Highway Research Abstracts*, November, 1953.

For the past several years the laboratory of the National Crushed Stone Association has been investigating methods for the direct measurement of the percentage voids and maximum specific gravity of bituminous mixtures. The method that has been developed consists of evacuating the entrapped air from a sample of uncompacted mixture and then determining the volume and specific gravity of the voidless mixture by water displacement. The percentage voids of compacted samples from the same mixture can then be computed from the difference between the specific gravities of the compacted and uncompacted mixtures. The publication of detailed accounts of these investigations has generated interest in establishing a standard test method. This article (see above) presents the test method and describes its advantages, limitations and applications.

The vacuum-saturation technique for the direct measurement of the maximum specific gravity of bituminous mixtures is believed to be a realistic solution to problems that have long confronted asphalt paving technologists. The test has certain limitations as to types of mixtures that may be used, but further research may eliminate these restrictions. With proper samples, the method is rapid, accurate, and requires no equipment that is not usually available at testing laboratories or that cannot be easily obtained. The method also eliminates the need for time consuming specific gravity tests on constituents which are really not applicable and should facilitate the study of mixtures where accurate information as to constituent materials is lacking. The test is now being used for the practical control of bituminous mixtures and it is anticipated that its use will be extended.

## Tip on emulsified asphalt storage

By H. P. Largent, Senior Maintenance Foreman, District 7, Texas Highway Department, San Angelo. (As described in "Texas Highways," the Texas Highway Department's staff publication)

The use of emulsified asphalt in this district has increased to the extent that year-around storage is nec-



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- J-16 Provides Protection from the oxidizing and volatilizing effect of the sun which dries out and reduces the life of such pavements rapidly.
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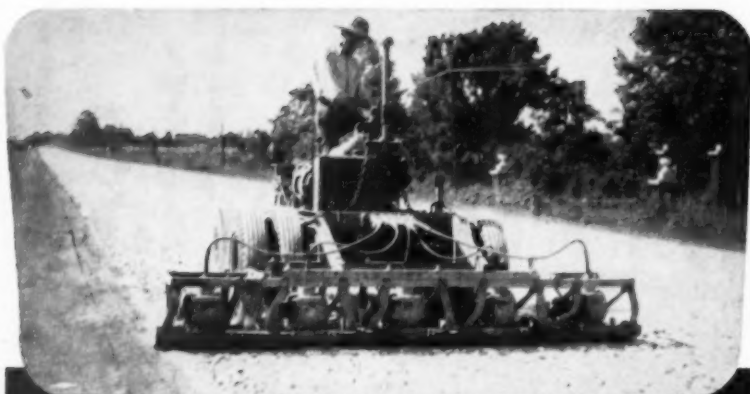


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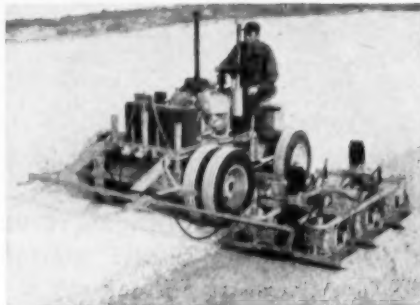


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**ON MACADAM CONSTRUCTION . . .** In one pass it will sufficiently compact 12" of rock to support smooth rollers. In four passes it achieves final density. And when sufficient fines are spread, one pass suffices to fill all voids. In GRAVEL SUB-BASES (blanket course) 7" thick, this machine has achieved 98% Standard Proctor in one pass. Standard width is 13', 3". Working speeds: 0-60 F.P.M. Reverse travel speed: 5 1/2 MPH.

### COMPACTS WIDENING STRIPS IN ONE PASS . . .

IN ANY GRANULAR MATERIAL used in flexible base-course widening. For this purpose compacting units are assembled in tandem, (3 deep, single or double row) and towed at side of tractor. Compactor bases of 12" and up may be substituted for standard 26" bases to suit requirements.



**SAND FILLS, SUCH AS BRIDGE APPROACHES . . .** another spot in which this machine shines. It's rapid and gets into places inaccessible to larger equipment. For the really tight spots one or more of the compacting units may be fitted with operating handles and used as self-propelling, manually guided compactors.

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VIBRATORS, Inc.  
LUDINGTON, MICH.



essary. The continuous "breaking" on the surface of the emulsified asphalt in storage tanks causes the formation of a thick asphaltic scum on the stored material. The length of time the material is stored determines the amount of asphaltic scum in the storage tank. Frequently there was as much as 200 gallons of scum that would not drain out of a 1,000-gal. tank and could not be used. Since there are not many methods of cleaning storage tanks available at maintenance sections, removing this scum and keeping the storage tanks clean presented a problem.

To avoid this trouble a small amount of diesel fuel is poured on the surface of the emulsified asphalt when it is placed in a storage tank. The amount of diesel fuel required depends on the surface to be covered; usually three gallons is sufficient to provide a thin covering over the material in a 1,000 gal. tank. The thin coat of diesel fuel excludes the air and prevents the "breaking" of the emulsified asphalt at the surface. Material stored in this way will drain out and leave the storage tanks reasonably clean. Also there is little or no lumping or stringing and all of the material stored is available for use.

Kerosene was also tried for this purpose. However, it was observed that kerosene volatilized to the extent that the protective film disappeared. Better results were obtained in this district using diesel fuel.

### Court decisions on business partnership

The U. S. Tax Court ruled recently that any amount paid to a withdrawing partner by the remaining partners in a business venture had to be treated as a capital expenditure and was not a business expense. In the case in point the withdrawing partner was paid a sum in excess of his holdings to induce his withdrawal. This refers to payments over and above the partners' capital investment.

The U. S. Court of Appeals holds that "proof that a cost-plus government contractor's purchasing agent tipped off a subcontractor to the fact that the sub contractor could increase his price without losing the sub contract is sufficient evidence to establish conspiracy to defraud the United States in violation of the false claims statute—even in absence of proof that the increased price was unreasonable."—*Virginia Road Builders Association*.

**New Hyster Dealer.** Bode-Finn Co., Cincinnati and Dayton, O., have been appointed dealers by Hyster Co., Portland, Ore., for its Industrial truck equipment. The territory includes southwestern Ohio, northern Kentucky and southeastern Indiana.

## BONDS FOR FREEWAYS

More than half the capital invested in American railways was raised by the sale of bonds. When a bond issue matures, the standard practice is to refund it by the sale of a new issue. May it not be wise, at least for the next 20 years, thus to finance the freeways built by cities and states? Thus the interest on the bonds will be the only annual burden of financing much-needed improvements, whereas if bond amortization is also undertaken, the annual financial expense will be about doubled. Interest rates on municipal bonds are about half those on mortgages on homes. Since individuals do not hesitate to pay not only those higher rates but to pay almost an equal amount monthly to cover taxes and amortize a mortgage on a home, they will favor municipal bonding for the sorely needed modernization of streets, and their accessory parking areas. The freeway program in the Los Angeles area can not be completed in less than 30 years if financed only by its share of the state taxes, motor fuels and license fees. For although those taxes are bound to increase, the need of more and wider freeways may grow even faster.

The directors of American railways for more than a century have relied upon the sale of bonds as an essential way of providing adequate railway service for a rapidly growing population. They have established a successful precedent that should be followed by our cities and states now that our highways have so largely become a substitute for railways. The total mileage of our railways is less than one-tenth that of our highways. About six times as many tons are hauled by trucks as by railway rolling stock; and this ratio is destined to become much greater.

## Reasons for controlled surveys

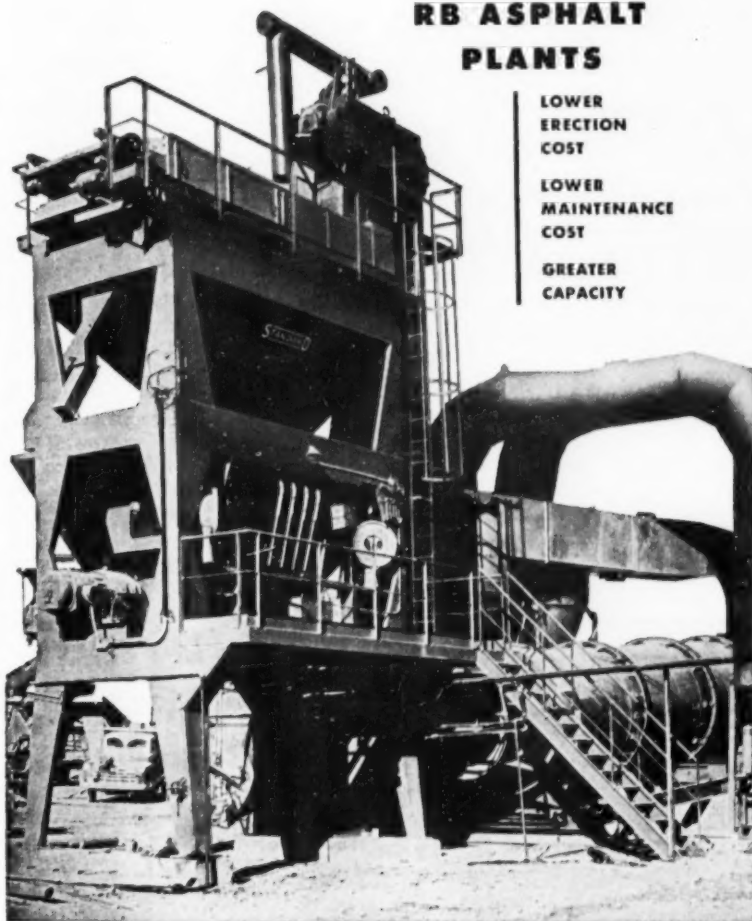
A controlled survey based on the national triangulation net can serve as a base for many other surveys—defense, cadastral, highway, state and county boundaries, city planning, county or state planning, and other public and private purposes. "If the special purpose of the controlled survey is an exacting one, the survey can be made to serve other less exacting demands in the same area and fewer surveys may serve more purposes." The use of control practically does away with the need for the random line in land surveys. The national net extends over the entire country, and

## FOR MORE ASPHALT PRODUCTION

*at lower cost*

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RB ASPHALT  
PLANTS



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Ruggedly built for years of heavy service and low cost operation. The complete STANDARD plant is constructed of compact, individual units for easy, cost saving erection, dismantling and transportation. For greater asphalt production and rock bottom maintenance costs... for increased PROFIT, follow the leaders across the nation—STANDARD-IZE with an RB Asphalt plant. Parts warehoused in New York and Los Angeles.



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Write for descriptive literature.



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is available accordingly.

The net, of course, is geodetic, but state plane rectangular co-ordinate systems established by the United States Coast and Geodetic Survey in 1933 have made the geodetic data available for local use without the application of geodetic formulas. There is a plane co-ordinate ( $x, y$ ) position corresponding to the geodetic position (*latitude, longitude*) of each triangulation station, so that for nearly all purposes, a surveyor may obtain geodetic accuracy while using plane surveying methods. Where greater refinement is required, all distortional effects may be eliminated by special computations.

There is a plane co-ordinate system for each of the states. Required data are available from the Coast and Geodetic Survey or state survey offices.

It may be possible to make an independent survey as accurate as a controlled survey, but knowledge of its accuracy can be obtained only through the use of a base survey or by comparison with control-survey data. The loop of an independent survey may have an almost perfect closure but that does not guarantee a near-perfect scale. Systematic errors, such as produced by an imperfect tape, may

accumulate and not be discovered; but they will eventually come to light in using the survey data, possibly to the embarrassment of the surveyor and at the builder's expense.

"A prominent teacher and surveyor in a mid-western state is reported to have said that by using the state co-ordinate system, he was able to do much of his field work on a survey before going to the field. A paradox? No! Just a simple statement of professional practice and an economy in time and effort and in cost."

*From a paper by Hugh C. Mitchell in THE MILITARY ENGINEER, January-February, 1954.*

### Tournapull job stories

Model C Tournapull job stories from around the U. S. assembled in convenient booklet form (pre-print book No. 6) is available from Advertising Department, LeTourneau-Westinghouse Co., Peoria, Ill. It consists of reprints of job stories on Tournapull operations in North Carolina, Alabama, Delaware, Ohio, Minnesota, Illinois, Kansas, Texas, Oregon, California and Washington. Informative data on haul length, load time and cycle time accompanies the illustrations.

### Handbook on hydraulics

"Hydraulic Tables," a pocket-size handbook prepared under direction of the Chief of Engineers, U. S. Army, has been reprinted by the Government Printing Office, where it is now available at \$2.50 a copy.

This is a 565-page handbook, originally published in 1944 and has been out of print for some time.

The book contains 46 tables which are helpful in solving the Manning Formula for flow in open channels. Some of the tables are extensions of tables in King's "Handbook of Hydraulics," and in the Bureau of Reclamation's "Hydraulic and Excavation Tables." Some are new tables.

A DYNAMIC HIGHWAY POLICY FOR THE FUTURE, is the title of a detailed report on the National Conference on Highway Financing, held December 10-11, 1953, in Washington by the Chamber of Commerce of the United States. A valuable reference for highway administrators and those concerned with highway legislation, financing and planning. Price \$2 per copy. Address Chamber of Commerce of the United States, 1615 H. Street, N.W., Washington 6, D. C.



The NEW ME-13 vibrator with new 2 to 2½ HP motor—greater power in a smaller "package."

## ANNOUNCING MORE IMPACT

### THAN EVER BEFORE!

A powerful vibrator that *maintains its kick and speed EVEN IN EXTRA-STIFF CONCRETE!*

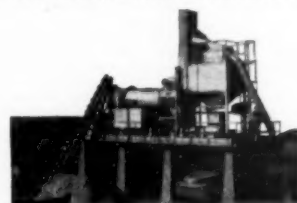
Moves concrete faster *WITHOUT* extra high speed (which causes excessive wear of equipment).

Needs no special generator—just 110 volt AC or DC.

Mounted on rigid or swivel base that keeps motor out of dirt, and prevents sand blowing into armature.

Satisfaction guaranteed. See it at your nearest WHITE equipment dealer.

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STATIONARY ASPHALT PLANTS  
15 — 30 tons per hr.



PORTABLE  
ASPHALT PLANTS  
10—15 tons per hr.



TAR KETTLES  
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## Expressway land deals aired in Detroit

As part of the democratic processes of government, Michigan governor Williams has asked state highway commissioner Ziegler for detailed information on real estate acquisition for Detroit's Edsel Ford Expressway. Under constitutional rights the governor may command reports from all public officials.

The Detroit newspapers headlined the matter, saying that questions have come up on the prices paid for various parcels of high-priced property, needed for the expressway right of way. It was claimed that the state highway department paid more for property parcels than did the Wayne county road commission for similar property, and that payments by the state have exceeded the highway appraisals by \$1,250,000 for the 72 parcels involved.

Commissioner Ziegler defended the state's work saying that speed has been an important factor due to the need to get the project going without delays. The honesty of the transactions has not been publicly questioned.

The Detroit review is part of a state-wide audit, first in the highway department's history, which will cover \$130,000,000 in land acquisition deals urban and rural during the last five years.

## Full time protection for temporary circuits

For temporary circuits needed in construction works and other outside jobs, a new "receptacle-type" outdoor service unit provides on-the-spot power with full circuit protection.

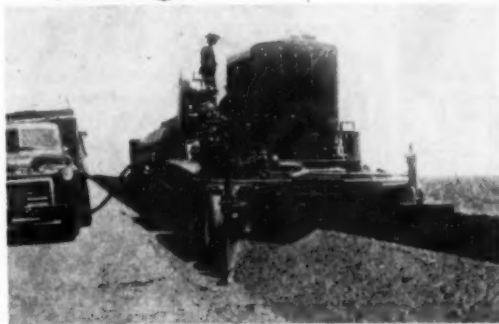
This unit has wired-in receptacles for tools, pumps, flood-lights and other equipment. It is portable and can be carried from job to job without makeshift arrangements. The only connections needed are those directly to the line.

Since this unit employs no thermo elements, current capacity of the unit is not affected by summer or winter temperature extremes—an important feature in outdoor equipment.

Should a fault in the line trip the breaker, the user restores current simply by switching the handle to the "on" position. The units are housed in rugged weather-proof enclosures, which may be pad-locked to prevent tampering. Plug-in receptacles are on the bottom, but the unit is also available with spring-hinged doors to enclose receptacles when not in use.—*Safety News Letter, Construction Section, National Safety Council.*



...for accurate control of proportioning  
...for extra-large capacity  
...for high-speed mixing  
...for single-pass operation



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MIX-IN-TRAVEL  
ROAD PUG

● Here is single-pass mixing at its best! This rugged, high-production MADSEN Mix-in-Travel Plant is capable of producing a lineal mile of 6-inch thick compacted material, 26 feet wide, in 8 hours. Handles with the ease of a track-type tractor. A MADSEN patented volume metering pump mechanically controls the volume of oil constant to the travel speed. No delays... road-oil is replenished in transit.

The MADSEN Road Pug provides maximum efficiency in producing low-cost road base and surface materials for secondary roads and airport runways.



Write today for complete details  
on the outstanding MADSEN  
Mix-in-Travel Road Pug.

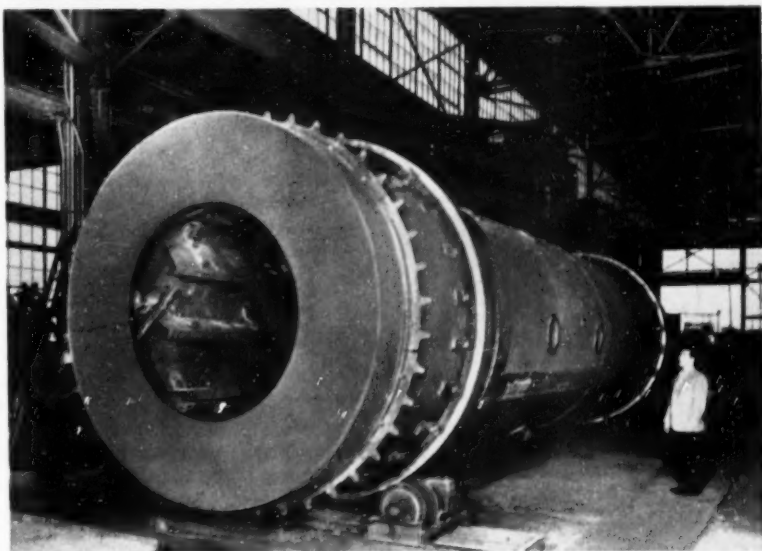
*Equipment that Serves*®

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LA MIRADA, CALIFORNIA

● Oklahoma's highway commission has adopted a policy of cancelling construction awards when underwriters of right-of-way requirements

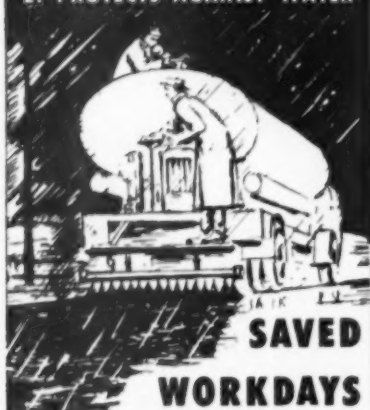
do not clear the property of encroachments within 20 days after a contract has been let.

## Big Dryer for Geo. M. Brewster & Son



● The largest two-fire asphalt dryer ever built was recently delivered to Geo. M. Brewster and Son Company of Bogota, New Jersey. This giant dryer, with a capacity of 150 tons an hour, was designed and built to Brewster specifications by the F. D. Cumber and Son Company. The dryer is a 96 in. by 35 ft. unit, utilizing a "two story" front fire box of special design. The unit weighs 21 tons.

1. STRENGTHENS THE BOND
2. PROTECTS AGAINST WATER



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WORKDAYS**

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During construction of the N. J. Turnpike, penetration courses were shot with **NOSTRIP**-treated asphalt under moisture conditions which normally would have halted the job.

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## Draining Downtown Street Corner —Without Storm Sewers

By **J. L. MORRIS**

City Engineer, Boise, Idaho

**B**OISE with its arid climate has practically no storm sewers. Sewers have been voted down twice in past years and the third try has yet to be made. Downtown there are only a few intermittent blocks of storm sewer, so nearly all the water run-off is carried in the gutters to ditches or drains, which finally empty into the Boise River. Many of our streets have minimum grades, some of the old ones with as little as 0.1 ft. fall in 100 ft., but we now try to obtain 0.3 ft. fall wherever possible.

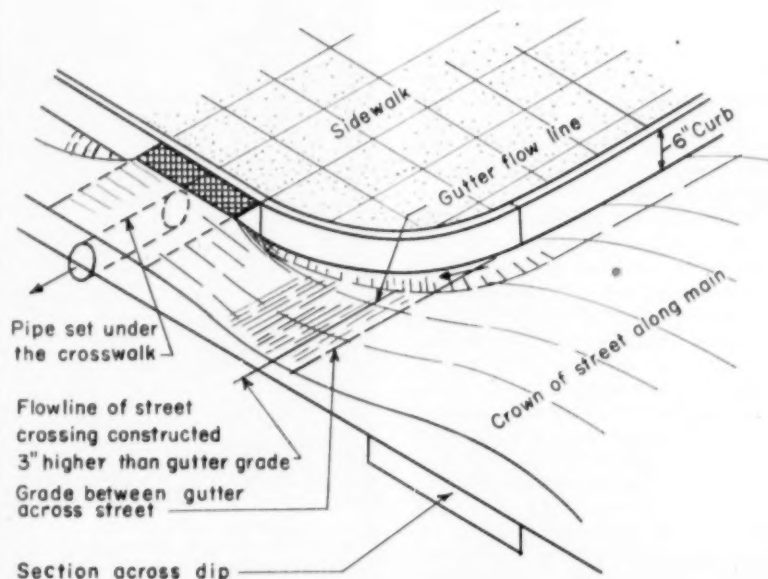
One of our street intersections (at 15th and Main Streets) lies at the foot of a small slope. The curb is a little less than 6 in. high and the floor of the store on this corner is at sidewalk level, only slightly above the curb. Both streets have been built up by successive layers of asphalt until the crowns are perhaps 4 in. above the curb.

As shown on the drawing the street drainage normally flows down the gutter on Main Street, passing around the curb radius and across the 15th Street in a pipe placed under the sidewalk crossing. That was fine until there was an extra amount of water,

or in the usual case until papers and leaves partially blocked the pipe under the street; then we were in trouble, immediately and everyone concerned was unhappy, which got to be too often.

### Overflow Section Tried

We tried a stunt which we had not seen before, which was to provide an overflow or spillway section across the side street. We replaced the old rusted pipe with a new 8-in. culvert, repaired the sidewalk crossing, and built a new concrete gutter around the curb radius in order to provide correct fall. We then took out the paving as much as 10 ft. both ways from the gutter line, excavated, put in about 8 in. of base rock, then paved with a dip across the side street. The flow line of this dip or street crossing was raised 3 in. above the theoretical grade between the two gutters, which is a point half way up on the face of the curb. As shown on the sketch a small amount of water now will run down the gutter around the curb radius and through the pipe under the side street. If a large amount of water is present—say 5 in. deep in the gutter—then some will run through the pipe but most would pass across the dip. If the pipe becomes plugged the water would all run across the

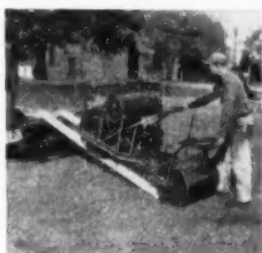


● Details of drainage scheme, as described by author.

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Pack in more profits by doing more jobs per day with this Con-Sol All Purpose Model Power Roller. It is extremely low in first cost, very inexpensive to operate and easy to maintain. And it can be moved quickly from job to job in a pick-up truck, station wagon, etc. It is ideal for laying asphalt and other "black-top" materials on driveways, sidewalks, parking lots — and patching jobs. Weight is adjustable between 375 and 1400 lbs.

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Ease of handling speeds up jobs, too. Steering lever, hand throttle and foot shift lever are all designed for maximum operating convenience. Sprinkler tank, with valve adjustment, flows water on rollers, keeps hot asphalt from sticking. Roller scrapers clean dirt, sod or paving material from rollers to guarantee smooth rolling jobs.



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Too!**

A chassis of welded channel steel, a top quality engine — Briggs & Stratton 2½ hp — and rollers of heavy gage steel combine to assure years of trouble-free, money-making operation.

Up your income in 1954—and in years to come—by adding one or more 1954 CON-SOL Power Rollers to your equipment

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INDUSTRIES, INC.**  
WEST CHESHIRE, CONN., U.S.A.

dip. Since fixing this intersection we have had no more trouble.

The dip is on the side of an arterial street where traffic must stop for signals, so it isn't objectionable. Any persistent small flow of water down the gutter will run through the pipe and not be splashed and tracked around by the traffic. The dip is dry practically all the time and the pavement should last longer since it isn't being deteriorated by being continually wet. The dip is shallower by this 3 in. raise than if it were built to the grade line between the two gutters, so it is easier riding. The main thing of course, is that it is practically fool-proof as far as any water plugging up the culvert and doing any damage is concerned.

This overflow street crossing works in this one location and we plan on fixing a few other intersections in a similar manner. We do not intend to install both a pipe and a dip all over town, but only where we have sufficient water run, where a dip is not too objectionable, and where a small pipe can be laid near flow lines.

R. E. Edlefsen is Mayor of Boise. As an engineer with the Idaho Department of Highways for 17 years and with Morrison-Knudsen Company construction, he is quite familiar with and of great assistance in our road and street problems.

Jim C. White is Street Superintendent. Formerly with the Idaho Department of Highways in all phases of road construction, and in private contracting for several years before coming with the city in 1951.

(Editor's Note: James Lester Morris, the writer, is City Engineer and acting Commissioner of Public Works, a registered professional engineer in Idaho since 1939, has been with City engineer's office for 10 years.)

- Urban freeways completed in Los Angeles (now 100 miles) pay economic benefits of at least 2 cents per vehicle-mile to users, according to economic studies. Hollywood Freeway now carrying 120,000 vehicles daily will earn its cost twice over in 20 years.

- Pennsylvania has 20,696 state highway bridges, of which 3,400 must be posted for either substandard capacity or clearance.

Gallon Promotes Borrer and Tiller. James M. Borrer, formerly Gallon northwest district representative, has been appointed sales manager for The Gallon Iron Works & Mfg. Co., Gallon, O. and J. H. Tiller, formerly district representative, has been appointed southern sales manager. Robert C. Monnett continues as sales manager for all other north central and eastern states.

## GRACE Asphalt and Compaction Equipment



3 sweeper models, axle, engine or tractor powered.



Chip spreaders 8' to 12' width. Also asphaltic concrete spreaders.



Rapid Fire circulating heaters heat and unload large tanks of asphalt.



Sheepsfoot Rollers 250 to 600 psi.



Rapidspray Maintenance Distributors. Also heaters for production melting of barreled asphalt.



Pneumatic rollers 7 to 50 tons.

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## St. Louis makes progress on traffic problem

St. Louis made strides in 1953 toward solving its traffic snarls, according to a news item quoting traffic commissioner Charles G. Gonter.

The chief means were the adoption of a master traffic plan, including one-way major streets downtown; rerouting of street car and bus routes; coordination of traffic flow by synchronized signals; and the barring of parking during rush hours on certain streets.

A jay walking ordinance was also enacted, and trouble spots in traffic were eased by dispersion and elimination of numerous left-turn locations.

A master traffic plan, sponsored by the Chamber of Commerce of metropolitan St. Louis, has been put in operation gradually throughout the past year. The result is a reduction in travel time to and from downtown, and a reduction in traffic fatalities for the year from 119 in 1952 to 106 in 1953. St. Louis County citizens were scheduled to vote on February 1 on a \$45,732,500 bond issue including \$32,124,000 for expressways, freeways, parkways and feeder roads. With Federal aid, this will be an \$89 million program.

The first modern expressway in St. Louis will be completed in 1954—a two-mile inter-regional link that will

circle the downtown area on the river front and later be tied in with state and county expressways.

## ARBA division officers

The following officers and directors were elected at the recent annual meeting of the American Road Builders Association:

### Materials and Supplies Division

Chairman, executive committee: A. E. Keeley, president, Prismo Safety Corp., Huntington, Pa.

Members of committee: J. E. McCracken, sales engineer, Bethlehem Steel Co., Bethlehem, Pa.; E. W. Bauman, managing director, National Slag Assn., Washington, D. C.; A. R. Taylor, sales engineer, Tar Products Division, Koppers Co., Inc., Pittsburgh, Pa.; Bernard E. Gray, president, The Asphalt Institute, New York, N. Y.; F. B. Brown, managing director, Wire Reinforcement Institute, Washington, D. C.; Dave Henderson, Armco Drainage and Metal Products, Inc., Washington, D. C.

Appointed Gorman-Rupp Representative: George W. Erbe has been appointed district representative for Gorman-Rupp Co., Mansfield, O., with headquarters in Houston, Tex. He formerly was associated with A. O. Smith Corporation at San Francisco, Los Angeles and Houston as sales engineer for electric motors and deep well turbine pumps.

## CARAVAN AXLES

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CARAVAN engineers consider the facts! No matter where your product is rolling . . . in open fields, on hazardous rain-soaked roads, through extreme cold . . . you are assured of dependable performance when it is mounted on CARAVAN Axles.

Designed and engineered for load stability, CARAVAN Axles provide a massive, heavy-duty steering arm . . . extra-heavy center arm stop blocks . . . heavy-duty steering knuckle . . . and precision ground spindles. These quality engineered assemblies guarantee positive trail at high speeds as well as stability for your equipment over the roughest terrain.

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## TOUGHEST • FASTEST • MOST EFFICIENT

### BLAST HOLE DRILLS

Fast, mobile McCarthy Vertical Blast Hole Drills cut blasting costs of the Apex Powder Company by more than 20% as compared to air, well or churn drilling on the two-million dollar, five-mile superhighway (Route 62) from Hubbard, Ohio, to Sharon, Pa. Cutting through two large areas of concentrated rock, 150 holes, 15 ft. deep, were drilled for each blasting pattern. About 3,000 cubic yards of sand rock were moved at each blast. Due to the ruggedness and mobility of McCarthy drills, the job was completed ahead of schedule. McCarthy drills can work for you too! Write to The Salem Tool Company direct for further information and our distributor will contact you promptly.

*Also manufacturers of Underground Horizontal Auger Drills*

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*Heavy-Rugged Powerful*

**SALEM**



**Fleet of SWENSON-Equipped Trucks Speed Blacktop Jobs**  
Contractors save money with Swenson Spreaders. Write for information.  
**Swenson Spreader & Mfg. Co.**  
Lindenwood, Illinois

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## BURCH Weather-Tite TARPAULINS

Now for the first time you can get the QUALITY BURCH WEATHER-TITE TARPAULINS in all weights, at a new low price. You are invited to write in for our new price list. . . Simply submit your request on your letterhead and you will be eligible for our dealer price list. Compare the quality—Compare the workmanship—COMPARE THE PRICE and you will specify BURCH WEATHER-TITE!

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FORT DODGE, IOWA DES MOINES, IOWA

**Find Out How You Can  
SAVE  
MONEY  
5-WAYS**

**By Mixing Your Own  
Concrete**

WRITE TO  
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### Lime stabilization methods

One of the more recent methods of stabilizing soils and soil-aggregate mixtures for base and subbase construction of roads is with lime, either quick or hydrated. For the first time the whole story of lime stabilization—its diverse methods of application, potentialities, its limitations, methods of evaluation, salient facts of 26 different lime projects, cost data—are contained in a new 68-page book, "Lime Stabilization of Roads," published by the National Lime Association. Address National Lime Association, 927 15th Street, N.W., Washington 5, D.C.

The book contains 21 photographs and 21 combined graphs, charts, and tables, as well as a selected bibliography of 24 different references. Single complimentary copies will be sent promptly to all inquirers.

### City problems in Africa sound much like ours

City administration and engineering problems seem to be similar, no matter what part of the world.

From S. S. Morris, City Engineer of Capetown, South Africa, come some interesting observations, given as part of the Alfred E. Snape Memorial Lecture on the occasion of the recent jubilee of the South African Institution of Civil Engineers.

Noting that Federal taxes have a priority and hamper municipal taxation, Mr. Morris observed: "The problem confronting every locality in the Union is how to meet the need for a larger and expanding program of construction and maintenance, while faced at the same time with shortages of both capital and annual revenue. Each municipality looks to its engineering department to solve this problem for it.

"To this end the municipal engineer must exploit the tool which is peculiar to his profession—scientific

method, the principles of which are basic to his training; he must employ it not only in design, where its use is accepted and universal, but also in other fields of his work—town planning, project planning, construction, management and administration.

"The tendency to oust the municipal engineer from his governing role in town planning is fraught with danger. Engineering realism alone can prevent municipal councils from being saddled with schemes masquerading in a mantle of attractive high-sounding phraseology but in actual effect devoid of scientific basis or engineering practicability.

The increasing curtailment of planning powers at present vetted in local authorities must also be resisted. Over-centralization in planning control inevitably stultifies enterprise and bogs down development in a welter of red tape and bureaucracy."

### Barber-Greene Company names new officers

W. B. Greene, President of Barber-Greene Company, material handling and road paving machinery manufacturers of Aurora, Illinois, announces his resignation as president, and the promotion of H. A. Barber to that office. Mr. Greene will continue his active participation in the company as Chairman of the Board of Directors.



W. B. Greene

Election of the following officers is also announced: S. E. Faircloth, vice president and production coordinator; E. H. Holt, vice president and director of sales; J. D. Turner, vice president and director of publicity and promotion; H. E. Herting, vice president and comptroller; R. C. Heacock, vice president and director of manufac-



turing and engineering; J. M. Spence, treasurer; W. A. Greene, secretary; Urban Hipp, assistant treasurer; F. J. Merrill, assistant secretary.

W. B. Greene's career is typical of the great American story. Born on a farm near Lisle, Illinois, he attended a country school and later the University of Illinois, receiving his B.S. degree in Mechanical Engineering in 1908.

It was at the university that he first

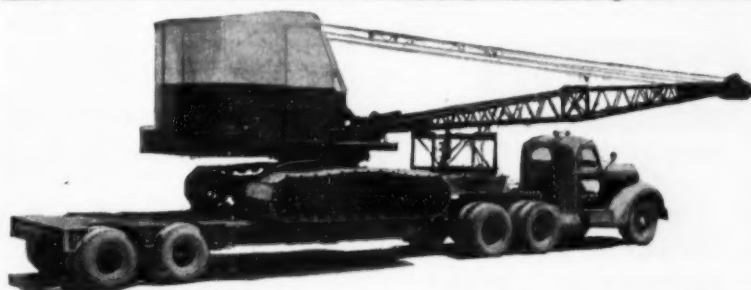


H. A. Barber

met the late Harry H. Barber. After leaving the university, he joined the Robins Conveying Company of Chicago. He later moved to Aurora, becoming advertising manager of the Stephens - Adamson Manufacturing Company where H. H. Barber was a sales engineer. Barber and Greene

visualized a market for standardized conveyors. With this initial idea, they started the Barber-Greene Company in 1916.

H. A. Barber who assumes active leadership of the company has a Mechanical Engineering degree from Illinois University. Joining the company



## YOU CAN DEPEND ON TRANSPORT TRAILERS

CARGO CARRIER MODEL GPX-F Especially designed for safe, secure hauling of heavy cantilever loads. Capacities 16 through 35 tons. Exclusive TRANSPORT tandem axle assembly gives full oscillation of each axle over rough roads . . . adds extra mileage to trailer tires . . . reduces road shock transfer to payload. TRANSPORT semi-trailers fit single or tandem axle truck tractors. Flat deck as shown or drop deck.

**FOR ADDED SERVICE** . . . Single or dual axle TRANSPORT front dollies convert to full trailers easily and quickly.

WRITE FOR  
COMPLETE  
INFORMATION



## WHAT ABOUT YOU, MR. READER?

Are you still active in the field? Have you moved or changed your position?

Unless you send this information direct to us we can't be sure. Sometimes a reader's name is cut from the mailing list because we are not sure that our information as to name, title and address is right. *Your* name might be cut from the mailing list.

### DON'T LET THIS HAPPEN TO YOU

Even if you think we know all about you, please fill in the information requested below and send to us by return mail. Our auditors require proof of accuracy of our mailing list. *You* are the only person who can help us on this. Do it now before you forget, so you can be sure your magazine will always be properly addressed to you. New names cannot be added or old names retained on our list unless we have *all* this information. *Please print or type.*

**ROADS & STREETS**  
22 WEST MAPLE STREET, CHICAGO 10, ILL.

Date \_\_\_\_\_

- ☐ I do receive **ROADS & STREETS** and wish to continue to receive it.  
☐ I do not receive **ROADS & STREETS** but would like to have it.

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Title or occupation \_\_\_\_\_

Firm name or Government department (give street address) \_\_\_\_\_

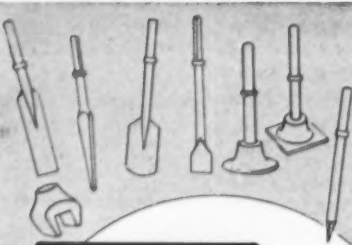
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(Zone, if any) \_\_\_\_\_

State \_\_\_\_\_

(If you have moved give old and new address) \_\_\_\_\_

Signature \_\_\_\_\_




**BICKNELL**

SINCE 1893, KNOWN FOR

*Quality*

**PNEUMATIC TOOLS and  
CONTRACTORS' SUPPLIES**

Write  
for Our  
Catalog



**BICKNELL**  
MANUFACTURING CO.  
ROCKLAND, MAINE

**Power in  
a handy  
"package!"**



Easy to move because it's balanced. Doors of this portable Electric Plant open for operation. Entire weatherproof housing is quickly removable for servicing. Gas tank is underneath for extra safety. Dependable "U.S." unit is D.C. for battery charging or operating portable tools. Available also in A.C. "U.S." builds the world's most complete line. Write for information, briefly stating your requirements.

**UNITED STATES  
MOTORS CORP.**  
420 Nebraska St.  
Oshkosh, Wis.



(Continued from page 84)

limited personnel and budgets, as well as state organizations, can benefit from the use of the layer method of interpretation in such endeavors as sounding out potential gravel deposits for highway construction and maintenance. Because of the highly satisfactory results obtained by the Michigan State Highway Department, a description of this method is considered worthy of being passed along to others engaged in the field of highway engineering.

I. Barnes, H. E., Highway Research Board, Bulletin No. 65, 1952.

on a full-time basis in 1933 as a field service engineer, and later as a design development engineer, he aided in the development of the company's asphalt finisher. He became chief engineer, then vice president in 1937.

**Harrington Made Assistant General Manager.** H. A. Harrington has been appointed to the newly created position of assistant general manager, Leschen Wire Rope Division, H. K. Porter Co., Inc., St. Louis, Mo.

**Constant Made Assistant Sales Manager.** Bert H. Constant has been appointed assistant sales manager of Baker Manufacturing Co., Springfield, Ill., replacing George D. Pharos, who has been appointed works manager of Baker's New Beardstown, Ill. plant, now under construction. In addition to other duties, Mr. Constant will be in charge of Baker's advertising department.

**NEW ST. PAUL HOIST DISTRIBUTORS.** Corts Commercial Body Works, Whitesboro, N. Y., has been appointed exclusive distributor by St. Paul Hydraulic Hoist, Minneapolis, Minn., for the trade area surrounding Utica, N. Y. Timpte Brothers, Inc., Denver, Colo., have been granted exclusive sales rights for the entire state of Colorado, and for the state of Wyoming, with the exception of eight northern counties. Sales territory of the state of New Mexico, with the exception of eight southern counties, was assigned Timpte's branch office in Albuquerque, New Mexico.

**NORRIS APPOINTED EASTERN REPRESENTATIVE.** N. D. Norris has been appointed eastern representative of Soiltest, Inc., Chicago, Ill., with offices at 545 Fifth Ave., New York, N. Y. He has been associated with Soiltest, Inc., for the past five years in a sales engineering capacity.

**HYSTER NAMES THREE TO SALES POSITIONS.** Appointment of three men to fill sales positions throughout eastern United States has been announced by Robert F. Moody, eastern division sales manager of Hyster Co., Portland, Ore. Jack Wright takes over as district manager in the northwestern district, James N. Rector moves to Atlanta as district manager of the southeast territory and Robert Hile becomes general manager of the Hyster retail store.



*Servicised*  
**CORK  
JOINT  
FILLER**

- COMPRESSIBLE-  
NON-EXTRUDING
- 95% RECOVERY  
AFTER  
COMPRESSION

Ideal for joint filling in flood walls, outlet works and spillways, sewage treatment plants, etc. Cork Joint Filler keeps joint filled at all times. Light color does not mar appearance of exposed concrete.

Write for details on Cork Joint Filler and the complete line of Servicised Asphalt, Cork and Rubber Composition Joint Fillers.

**SERVICISED PRODUCTS CORP.**  
6051 W 65TH ST. • CHICAGO 38, ILL.

SOIL AIRE

**ROLLPAC**

Ruggedly built for heavy duty service



**\$895.00**

Detachable  
Outside Edge  
Wheel. Rolls Rush  
with curb or wall.  
Patented

A Standout Popular-Priced  
One Ton Roller. Send for  
Catalog.

**SOILAIRE INDUSTRIES**

Minneapolis 3, Minnesota

Sold by over 75 distributors in United States and Canada

## FOR SALE

Two—DW10 Caterpillar Tractors with Scrapers. Good condition, \$7500.00 Each.

One—Shovel Front for Model 25 Northwest \$2750.00.

One—804 Barber-Greene Mix-all, been demonstrated only, \$4425.00.

### WATKINS-ALDRIDGE EQUIPMENT CO.

912 SOUTH STATE STREET  
PO BOX 3033  
JACKSON, MISSISSIPPI  
TELEPHONE 3-2451

## FOR SALE (Come and Look)

- 1—1½ yd. P&H Crane 80' Boom, same as new 25% off
- 1—¾ yd. Byers Crane Model 83 with new shovel front (rebuilt)
- 1—1 yd. General Invincible Dragline Cummins Diesel power
- 1—1¾ yd. Osgood Chief Combination (completely rebuilt)
- 1—1½ yd. Loraine 78 Combination (excellent condition)
- 1—1¾ yd. Loraine 75 shovel and crane
- 1—600 O.F.M. Compressor Murphy Diesel (bargain)
- 1—500 O.F.M. Compressor Caterpillar (used six months)

**R. G. ALDRIDGE,**  
Contractor

1600 Nebraska Avenue  
Kansas City, Kansas

## FOR SALE

Universal gravel washer 4 ft. Rotary with scrubbers, screws, etc., complete mounted on 2-30 yd. bins (6 compartments). All Electric.

Above equipment used four years, good condition.

¾ buckeye 70 dragline crane, 45 ft. boom—good.

1 yd. Lessman Rubber tire loader, used two years, new motor.

Above equipment can be seen in operation, will consider terms, or will sell as business with material rights.

**TOM McCUE GRAVEL COMPANY**  
Sterling, Illinois Telephone 1060

## Wanted 2½ to 3 Yard Shovel and Drag

IN EXCHANGE FOR SALEABLE MACHINERY, HAVE:

- 2—Imperial Atlas diesel 300 HP generators, 2300 volts and all equipment.
  - 1—500 KW Westinghouse D.C. set, complete all controls.
  - 2—150 KW G.E. sets, all 2300 V. motor, D.C. and gen. 250 D.C., all controls.
  - 1—Large 8 ft. Drum Hoist, 1 double drum hoists and electric motors. This machinery is A-1 condition.
- Have a ¾ yard P&H crane, new.  
5—Kochring Dumpsters Rock Trucks, G.M. diesel engines.

**A. M. PARK, Lincoln, Illinois**

## FOR SALE

- 1 Johnson Model TY-320-1 Cement Charger. New 1953, used only 2 months.
- 2 Baughman Model TST 10 Cement Bodies. New 1953, used only 2 months.
- 1 Seaman Pulvi-Mixer with 6 foot SC Rotor Assembly, Continental Gasoline Engine Powered.
- 1 Rosco Bituminous Distributor Model E, Circulating Spray Bar, Semi-trailer mounted on International KS8 Tractor.
- 1 Adams No. 11 Elevating Grader, 48" belt, slightly used, PA 40 International Power Unit.

All the above reasonably priced for quick sale.

**JOHN DIESETH COMPANY**  
Fergus Falls - - - Minn.

## FOR SALE

1 ea. 4/10 cu. yd. Shovel Attachment for Model E Quickway Truck Shovel — \$800.00

1 ea. Complete Angledozer Attachment for IH Series D-8. Attachment includes LeTourneau DDPCU and overhead frame and 12½ ft. Southwest Angledozer-Radiator Guard. \$1250.00

1 ea. Complete Cable Bulldozer Attachment for 3T Series D-7 Attachment includes LeTourneau DDPCU-Radiator Guard and Sheaves and 10 ft. Hell Bulldozer Blade. \$900.00

**WALT KUNZ**  
7404 BEECHMONT AVE.  
CINCINNATI 30, OHIO

# NOW! Get Circulation Where It Counts . . . Roads and Streets' Clearing House REACHES THE MARKET'S HEART

INDIVIDUAL CONTRACTORS  
CITY, COUNTY ENGINEERS  
CITY, COUNTY OFFICIALS

Long a leader serving the heavy construction and associated fields, **ROADS AND STREETS'** "cream" circulation goes to the important men in the business. They are the men, who directly or indirectly influence the purchase and sales of new and used equipment and supplies.

When you are "in the market" reach the logical buyer or seller quickly —at a reasonable cost to yourself.

Use the Clearing House!

Just clip the coupon below and attach your copy.

CLIP YOUR AD COPY TO THIS HANDY ORDER FORM AND MAIL TO—

### CLEARING HOUSE SECTION ADVERTISING RATES

TRANSIENT RATE—\$10.00  
Per Column Inch Per Insertion

CONTRACT RATES — BASED ON  
USE OF TOTAL SPACE INDICATED  
WITHIN YEARLY PERIOD.

12 in.	80.00
24 in.	9.38
36 in.	9.19
48 in.	9.00
60 in.	8.80
72 in.	8.66
84 in.	8.50
96 in.	8.33
108 in.	8.18

### COPY AND CLOSING DATES

Final closing date is the Fifteenth of the preceding month. Magazine is issued 1st of publication month. If proof desired, copy must be received 5 days preceding closing date.

### CLEARING HOUSE SECTION ROADS AND STREETS

22 W. MAPLE STREET, CHICAGO 10, ILL.

Please Insert the Attached Advertising Copy in the Next Issue of **ROADS AND STREETS** to Occupy.....Inches of Space.

Number of Insertions.....

Name.....

Company.....

Address.....

City.....State.....

TELL US WHAT YOU HAVE TO OFFER AND WE'LL SET UP THE AD FOR YOU.



## LAND CLEARING TOOLS

### CLEARING BLADE ON CRAWLER TRACTORS WILL MAKE YOU MONEY

Will clear from 5 to 8 acres per day. Cuts off trees from one to three inches under ground leaving no stumps. Less disturbance of top soil. Land ready for immediate use. Cuts trees up to 5 and 6 feet in diameter. Will also uproot trees same as dozer where necessary. Operating in 12 states where it has been introduced. Have been used for clearing problems for Levees, Pipe Lines, Right-of-Ways, Reservoirs, Lakes, Strip Mines, Cultivation and many other operations. Tests prove that it costs much less to clear with this Blade than by any other clearing method on the market today. Patented Sept. 1st, 1953. No. 2,650,628. Patent applied for Aug. 14, 1952.

### RAKES FOR CRAWLER TRACTORS

Each tooth is made of a solid piece of 2 1/2" steel. Will withstand rugged operation.

This rake is a solid unit with the solid teeth an integral part. This rake can "take it".

The teeth are set so that they can be easily run at the desired level without "digging in".

This rake is designed to move large quantities of trees and brush. Will compact larger quantities into smaller areas.

These compacted piles can be easily burned.

A strong, sturdy rake that surpasses any on the market for piling brush, trees, stumps and roots. This rake was designed to meet the requirements of land clearing companies. THIS RAKE IS RAPIDLY REPLACING OTHER TYPES OF RAKES.

MANUFACTURED AND DISTRIBUTED BY:

**CROSSVILLE TOOL COMPANY**  
BOX 138 — CROSSVILLE, ILLINOIS

## PARTS HEADQUARTERS

### SATISFACTION GUARANTEED

New & Used Parts For All Popular Crawler Type Tractors & Patrols.

### SPECIAL

Street Pads for 3T-D7 new at \$4.00 net each  
List Price, \$14.28 each.

D-13000 Diesel Electric Set For Sale or Rent.

We number our Satisfied Customers by the hundreds from all sections of the Country.

**JACKSON TRACTOR PARTS COMPANY, INC.**  
Highway 80 West, P. O. Box 3124, Jackson, Mississippi  
Day Phone 2-6641 - Night Phones 2-3276, 2-6416

## AIR COMPRESSORS

Worthington Model HTS-210,  
Cap 210 CFM, 100 PSI,  
Mounted on 4 Wheel Trailers.  
Condition Very Good.  
PRICED TO SELL - \$1,595.00

LeRoi Air Compressors Model 105,  
Suitable for Truck Mounting.  
Condition Very Good.

PRICED FOR QUICK SALE - \$1,250.00

**LAZAROV SURPLUS  
SALES CO., INC.**

1450-52 Thomas St., Memphis, Tenn.  
Phones 8-7253, 37-2536, 37-2537

## NEW STEEL PIPE

7 " O.D.	.317 wall	200 feet
8 1/2 " O.D.	.352 wall	1000 feet
9 1/2 " O.D.	.395 wall	1680 feet
9 1/2 " O.D.	.460 wall	1000 feet
10 1/2 " O.D.	.250 wall	380 feet
12 1/2 " O.D.	.250 wall	400 feet
16 " O.D.	.250 wall	460 feet
20 " O.D.	.281 wall	300 feet
24 " O.D.	.281 wall	720 feet
24 " O.D.	.406 wall	920 feet
26 " O.D.	.281 wall	1600 feet
26 " O.D.	.312 wall	820 feet
26 " O.D.	.500 wall	120 feet
30 " O.D.	.500 wall	1000 feet

All 40 foot lengths  
Electric Weld Joists  
Special Low Price for Immediate Delivery  
Write — Wire — Phone

**SONKEN-GALAMBA  
CORPORATION**

2nd and Riverview (X-100)  
Kansas City 18, Kansas  
ATwater 9305

## HEAVY DUTY VALUES

1 NORTHWEST 80-D Murphy Diesel, 1948, perfect shape. \$19,000.

13 MACK TRUCKS, Model SCSW, 30-ton Tandem, 1947 and 1948. 3 to 4 new tires each unit. Also \$20,000 new parts. Any reasonable offer.

4 EUCLIDS, 22-ton, 1949 and 1950. Any reasonable offer.

**BRETTO EQUIPMENT CO.**  
HIBBING, MINNESOTA

## FOR SALE

### AT REDUCED PRICE

Reason: Operation suspended

1 - 7W Monighan

1 - 1600 P&H 6 yard

The following to be sold as one lot:

3 - E-50 Tournarockers

2 - Extra tiers

1 - Air wrench

1 - 6000 gallon Propane Tank with the necessary pumps

WRITE OR PHONE 3105 POTTSVILLE

**FRANK COLITZ**  
POTTSVILLE, PENNSYLVANIA

## FOR SALE

Universal portable crushing plant: Model 880 Junior Gravelmaster, Serial No. 525x10, power D Cat. motor, 30 ft. field conveyor. In very good condition.

Unit Crane Model 614, new 1950.

Allis Chalmers bulldozer HD9, Garwood hydraulic blade, used less than 1000 hours. 50 Foot 24 inch conveyor.

**Sorensen Trucking & Exc. Co.**  
RFD 4 - Ottawa, Illinois

## FOR SALE

Caterpillar #12 grader, S.N. 7T401. Very good condition.  
\$5,750.00

Haiss 75C loader on cats. Cleaned and painted .....\$2,500.00

**CAREY BROTHERS STONE CO.**  
Rural Route 4 Dayton 7, Ohio  
Phone Trotwood 7-4364

## FOR SALE

8 - 16" Superior Super Woodworker with 18 HP Wisconsin air cooled engine, tilt table to 45 degrees, depth of cut 0 to 4 3/4". Bargain price at \$395.00 ea.

### ALSO - NEW - BARGAIN PRICED TO SELL

80,000 ft.—Seamless tubing, steel C.R., SAE 1010, random lengths.  
4,430 Lin. ft.—3" black enamel conduit.  
2,070 Lin. ft.—4" black enamel conduit.  
199—4" Galvanized conduit couplings.  
94—5" Galvanized conduit couplings.  
76—6" Galvanized conduit couplings.  
97—2" Galvanized 48 radius elbows.  
17—3 1/2" Galvanized 90 degree conduit elbows.  
94—4" Galvanized 48 radius conduit elbows.  
40—4" Galvanized 90 degree conduit elbows.  
20—5" Galvanized 90 degree conduit elbows.  
62—5" Galvanized 90 degree conduit elbows.  
2—5" Galvanized 45 degree conduit elbows.  
33—3" 90 degree Bl. enamel conduit elbows.  
133—4" 90 degree Bl. enamel conduit elbows.  
34—3" Bl. enamel conduit couplings.  
219—4" Bl. enamel conduit couplings.

### Brown Equipment Co.

P. O. Box 699 Phone: 1382 & 1388  
MIDDLESBORO, KENTUCKY

## DODGE 1 1/2 TON 6x6's



IN EXCELLENT CONDITION - PRICED AT FRACTION OF ORIGINAL COST.  
IDEAL FOR: TOW TRUCKS, SNOW PLOWS, LANDSCAPERS, FARMING,  
CONTRACTORS AND OFF-THE-ROAD WORK.

**\$895 with winch**

**\$695 without winch**

EQUIPPED WITH 9.00X16 TIRES

### THE U.S. TRUCK SALES CO.

1750 E. 55th St. • Phone: UTAH 1-0400 • Cleveland, Ohio

## FOR SALE

- 1 Model 150 rubber tired Hyster Fork lift, will lift 5 ton 24' ..... \$7,500.00
- 1 Model HD14C Allis Chalmers tractor with Baker DDPCU and bulldozer blade ..... 5,000.00
- 1 Model 104 Eimco Rocker shovel mounted on Cat. D-4 tractor with two buckets 1 1/2 yd. and 2 cu. yd. .... 9,000.00

### Malden Equipment Corp.

128 Newland Street  
MALDEN, MASSACHUSETTS  
TELEPHONE MALDEN 2-5540

### HERE ARE THE BEST BUYS

#### CRANES & HOES

Manitowoc	"2000"	Used 1 1/4 yd. Diesel Shovel.
Northwest	"18"	1/2 yd. Dragline, 30' Boom and Fairlead.
Unit	"514"	Used 1/2 yd. Dragline.
Osgood	"200"	1/2 yd. Trench Hoe, or Dragline.
Manitowoc		Shovel Attachment complete for Model 1600 or 2000.

#### TRACTORS & LOADERS

M-M	"RT1"	Used R.T. Industrial Tractor with Wagner Loader. Cheap.
Haiss	"75C"	Used Crawler Bucket Loader.

#### CRUSHING EQUIPMENT

Cedarapids		Portable Primary Crushing Plant w/1524 Jaw Crusher, 24" x 6'0" Feeder, 30" Discharge Conveyor 90 H.P. gas power, pneumatics.
Diamond	"1536"	Used R.B. Jaw Crusher.
Caterpillar	"D8800"	Used Diesel Power Unit.

#### TRANSIT MIXERS

Jaeger	4 1/2 Yd.	Used Hi-Discharge Transit Mixer, un-mounted.
Ransome	3 Yd.	Used Hi-Discharge Moto-Mixer, un-mounted. Cheap.
Jaeger	3 Yd.	Used Hi-Discharge Transit Mixer w/Chev. '48 Tandem.
Rex	3 Yd.	Hi-Discharge Moto-Mixer, mounted on Int. L-170 Tandem axle Truck.

### EIGHMY EQUIPMENT COMPANY

Pierpont at West State St., Rockford, Illinois

Phone 4-6706

### FOR SALE

- 1 Model 82A Barber-Greene loader, gas powered
- 1 Model B Scoopmobile
- 1 Insley 1/2 yd. shovel front
- 1 30"x45' portable conveyor, arranged for screen. International U2A power unit, 7:50x20 tires.
- 1 Parsons Model 221 Trenchliner, gas powered
- 1 Whiteman power buggy, used only 20 hours, in excellent condition

All in good condition and reasonably priced.

### RUFFRIDGE-JOHNSON EQUIPMENT CO., INC.

3024 S.E. 4th St. Minn.  
Minneapolis 14 - PRIOR 7147

For Sale—Priced for quick movement.  
Mod. D—A.C. Patrol, Ser. #D2162 with blade, scarifier, lights & cab.  
Excellent Condition!

### PECAUT EQUIPMENT COMPANY

P. O. Box 777 Sioux Falls, S. Dak.

## PRICES REALLY CUT ON THIS NEW CONSTRUCTION EQUIPMENT

- 1—Half yard shovel, Osgood, with G. M. Diesel
- 1—Power Grader, American, with 10 ft. moldboard, scarifier, cab
- 1—Bucket Loader, Eagle, mounted on new Ford Truck
- 1—Terratractor, GT30, with front end loader and angledozer blade

### R. B. WING & SON

384 Broadway

Phone 3-4161

Albany, N. Y.

**FOR SALE  
AT ATTRACTIVE PRICES  
SURPLUS EQUIPMENT FROM TRENTON DAM  
(Nebraska)**

1—1201 Lima Shovel-Drumline  
1—1055LC P&H Dragline-Crane  
1—51-B Bucyrus-Erie Shovel  
1—1600 Manitowoc rubber tired Wagon Crane  
1—Northwest 25 Dragline  
10—International TD-24 Tractors  
7—Caterpillar D-8 Tractors  
6—25 cu. yd. Bottom Dump Euclid Wagons  
6—13 cu. yd. Bottom Dump Euclid Wagons  
2—15 Ton End Dump Euclid Wagons  
7—LaPlante-Chaote Motor Scrapers  
4—LeTourneau FUB Carry-All Scrapers  
5—USBR type 2 drum Sheepsfoot Tampers  
4—Caterpillar 12 Motor Graders

1—Side Dump RR Car Tipper  
1—Aggregate Shuttle Conveyor System  
1—C.S. Johnson 225 T. Concrete Batch Plant  
2-4 cubic yd.  
1—G.E. 50 T diesel-elec. Locomotive  
10—Compressors, 15 to 315 cu. ft.  
23—Light Plants, 1.5 to 10 Kilowatt  
26—Transformers, 10 to 100 KVA

Many miscellaneous items such as concrete placing equipment, air and electric tools, small tools. Stock of parts for above equipment.  
Most items have been repaired for next project.

**TERMS TO QUALIFIED BUYERS**

Phone, Wire, Write For Catalogue

**VINNELL-UNITED-BELL**

**Box 178**

**TRENTON, NEBRASKA**

**Phone 2151**

**EARTH BORING MACHINES**

We have new and used reconditioned earth boring machines. We sell and service Sterling Hydraulic Controlled Earth Boring Machines on a national basis. Used machines come to us as trade-in equipment. We have on hand - -

1 - F.W.D. truck - 5 man cab with H.D. Heavy Duty Highway Digger, double drum winch - Telescopic pole setting device Line body - all in one unit. Very good condition - \$2995

1 - Chevrolet 1½ ton truck, 4 Wheel Drive with Highway HD power take-off digger in good condition. Rebuilt - \$2,950.

1 - Jaques Model H.M. self-contained unit completely rebuilt with latest type clutch and modernized features. Ideal for mounting on trucks and for fast removal - \$2575 and up.

Used Line Trucks - priced to sell. 5 man cab - \$1650.

Used Rebuilt Pole Trailers - FOB Forty Fort, Pa. - \$395.

New Cable Reel Trailers in stock at all times.

New Sterling Earth Boring Machines - Model 'A' and 'Enterpriser'  
available for prompt delivery.

**WYOMING VALLEY EQUIPMENT COMPANY**

**1089 WYOMING AVENUE FORTY FORT  
WILKES-BARRE, PENNSYLVANIA**

**LIMA  
SHOVEL 604**

Shipped 1951—1¾ yard Dipper

Diesel Powered. Excellent  
Condition. \$30,000.

**H. O. PENN MACHINERY CO. INC.**

**140th and East River  
NEW YORK, N. Y.  
Ph. CYPRESS 2-4800**

**FOR SALE**

Erie Strayer Portable Concrete Plant. Capacity ¾ cu. yd.—25 yd. per hr. capacity. Completely overhauled. Bargain—will trade for crawler equipment.

**CONSTRUCTION SERVICE, INC.  
LUDLOW, KENTUCKY**

**USED EQUIPMENT  
FOR SALE**

1—Marion Model 4161 Ward-Leonard Electric Dragline, 110 ft. boom, 4 yd. bucket.

1—Marion Model 4161 Ward-Leonard Electric Shovel with additional new and unused dragline attachment.

1—Marion Type 7200 Diesel Walking Dragline, 135 ft. boom, 5 yd. bucket, equipped with Fairbanks-Morse main diesel engine and a Cummins diesel engine driving generator for electric swing.

1—Marion Model 4121 4 cu. yd. Ward-Leonard Electric Shovel equipped as shovel only; several years old but good condition.

1—Manitowoc 4500 Diesel Dragline equipped with 140-ft. boom, 4 cu. yd. drag bucket equipped with Caterpillar diesel engine.

The above material in excellent condition—all located in Central Pennsylvania.

**CONTRACTORS EQUIPMENT  
& SUPPLY COMPANY**

**800 North Delaware Avenue  
Philadelphia 23, Penna.**

**FOR SALE**

Heavy Duty ¾ yd. General Dragline 9 mos. old. Save \$5000.00 TD9 INT. with B.E. dozer. H. INT. with farm dirt loader.

**CARL FOOTE**

**Leslie, Michigan - Phone 5631**

**ATTENTION**

**Gravel and Stone Producers**

Gravel plant, 125-ton per hour capacity consisting of six wood bins, one 48" x 26'6" triple jacket revolving screen, two vibrating screens, two sand separators, one 4' Symons Cone Crusher, one roll crusher, one 8" centrifugal pump, 16" to 30" material conveyors. All plant equipment individually motor driven. Plant located adjacent to railroad on twelve acre tract, 3250' of loading tracks.

Gravel deposit depleted, available stone deposit within economical operating belt conveyor distance. Shipments may be made on two major rail lines without switch charge. Good setup for experienced stone operator. Prefer to dispose of plant as a unit but will consider selling piecemeal.

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- 1—Insley K12 Motor Crane, 10 ton
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- 1—Link Belt HC70 Truck-crane, 15 ton
- 1—Keystone 18A Truck-crane, 20 ton
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All in good condition and reasonably priced.

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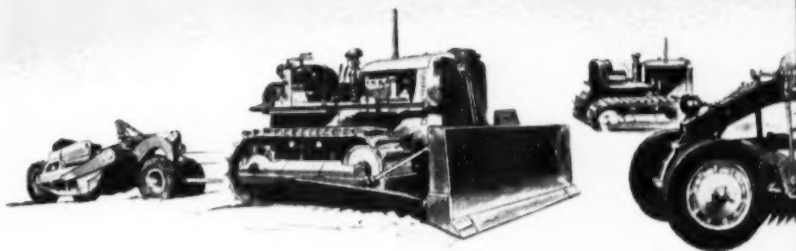
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**ANNOUNCING A**

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Your Caterpillar Dealer offers you three clear-cut classes of used equipment. He backs each one in writing. You buy with confidence, sure that the equipment is honestly described. See him for the best values on the market!

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# 33 year old paving



Clark Street, Stevens Point, whose 33 year old Texaco Asphaltic Concrete pavement has received one seal coat.



Main Street's Texaco Asphaltic Concrete pavement has been seal-coated twice since 1921.



The Texaco Asphaltic Concrete pavement on Church Street was given a single seal coat in 33 years.

Stevens Point, Wisc., used old macadam streets as base for new Texaco Asphaltic Concrete surface in 1921. W. F. Reichardt was consulting engineer.

The experience of Stevens Point, Wisc., proves conclusively that an old, well-consolidated macadam street provides an excellent base for a new Texaco Asphaltic Concrete surface. There are a number of Texaco-surfaced macadam streets in Stevens Point, which have been carrying the city's traffic for the past 33 years. Based on their present condition, they will continue to give satisfactory service for some years to come. In addition to local traffic, they are called upon to carry the through traffic of two important State highways.

The cost of maintaining Stevens Point's asphalt-surfaced macadam streets has been low. Several of the streets have been given a single seal coat over the years. Others have been seal-coated twice. The city has expended an average of 1½¢ per square yard per year for the upkeep of most of this 33 year old paving.

Stevens Point is another of the more than 1500 U. S. cities from the Atlantic to the Rockies on whose streets resilient Texaco asphalt paving has demonstrated its durability and low upkeep. Asphaltic Concrete and Sheet Asphalt are the types of Texaco asphalt construction most commonly used on heavy-traffic streets. Asphalt Penetration Macadam provides a durable pavement where satisfactory stone is available. Low-cost Texaco asphalt surfaces of the plant-mix and road-mix types are designed for a city's less heavily traveled streets.

Two helpful booklets for the city official desiring information on the various types of Asphalt street construction can be obtained by writing our nearest office.



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